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REVISION OF THE AUSTRALIAN VITACEAE,
3. *CISSUS* L.

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Summary

The genus *Cissus* L. is reviewed for Australian species, as well comments on species occurring in New Guinea are included. Two species, *C. pentaclada* and *C. vinosa* are described as new, and a new combination, *C. cardiophylla* based on *Vitis cardiophylla* F. Muell., is made. The occurrence of *C. aristata* on Dauan Island in the Torres Strait represents the first record of this species for Australia. A description of the genus and each of the fourteen species occurring in Australia is given, together with a key to the species.

CISSUS

Cissus L., Sp. pl. 1: 117 (1753); Descoings, Notul. Syst. (Paris) 16: 118 (1960).

Cissus sect. *Eucissus* Planchon in A. & C. DC., Monogr. phan. 5: 472 (1887). **Type:** *Cissus vitiginea* L.

Climbing or scrambling vines, evergreen or deciduous; stems rounded, striate or winged, mucilage present sometimes copious; underground system sometimes tuberous. Tendrils leaf-opposed, unbranched or branched, each branch or aborted branch subtended by a bract. Leaves alternate, simple or palmately 3–5(–7)-foliolate, margins entire, indented or occasionally lobed; domatia may be present on the abaxial surface. Stipules 2, caducous. Degree and type of pubescence on aerial parts varies between species. Inflorescence leaf-opposed, pedunculate, multiflowered in umbellate cymes, or paniculate with terminal umbels, often loose; peduncles and pedicels subtended by bracts. Flowers bisexual, tetramerous except in one species which is pentamerous. Calyx cup-shaped, entire or shallowly lobed. Corolla with 4(–5) free lobes, cohering in bud by the interlocked epidermal cells, cucullate at the apex, reflexed after anthesis, soon caducous. Stamens inserted on the receptacle at the base of the disc, opposite the petals, filaments erect, often flattened, anthers introrse, dorsifixed, opening by longitudinal slits. Pollen grains tricolporate. Disc adnate to and entirely surrounding the ovary, margins sometimes slightly lobed. Ovary 2-locular with 2 anatropous, basally attached ovules per locule; style cylindrical or conical, stigma minute, entire, expanding after anthesis. Berry fleshy with 1–4 pisiform, ovoid, pyriform or rarely elongate seeds. Shape of seeds in transverse section varies according to the number maturing in the fruit; the perichalaza usually extends to the dorsal surface where it forms a rounded or elongated flattened area; 2 furrows or pits are present on the ventral surface. Endotesta irregularly lignified, endosperm ruminate, appearance in median transverse section is constant for each species. Mucilage cells and raphide sacs also often with mucilage appear to be present in all organs.

The genus *Cissus* as described by Linnaeus is now generally recognised as being composed of three genera: *Cissus* L., as amended by Descoings (1960), *Cayratia* Juss., and *Cyphostemma* (Planchon) Alston. The characters distinguishing *Cayratia* from *Cissus* have been outlined by Gagnepain (1911), Latiff (1981) and Jackes (1987b), whilst Descoings (1960) discussed the features which differentiate between *Cissus* and *Cyphostemma*. Although Descoings noted (*loc. cit.*) in *Cissus* that the leaves are occasionally compound, he considered the berries to be monospermic. Whilst species with simple leaves have 1 rarely 2 seeds, except for *C. antarctica* Vent., and *C. oblonga* (Benth.) Planchon, most species with compound leaves (*ca* 15 species) appear to have 1–4 seeds per fruit.

There are two features which distinguish *Cissus* from *Cayratia* and *Cyphostemma*.

1. The inflorescence is a leaf-opposed umbellate cyme (Mulgura de Romero 1978), although it sometimes appears to form a panicle with terminal umbels.

2. Leaves are usually simple, but if compound, then palmately 3–5–7-foliolate and the petiolules are absent OR if present then the central petiolule is less than twice that of the laterals, rarely longer, if so then fruit is 1-seeded with two ventral furrows.

Although intraspecific variation occurs with respect to leaf size, shape and degree of pubescence, the latter also decreasing with age, the most useful characters are: relative size and shape of leaves; nature and position of pubescence; seed features; number of tendril branches and nature of the stipules. All measurements and observations in this paper refer to dried mature organs except where otherwise indicated.

There are about 350 species of *Cissus* distributed throughout the tropical and to a lesser extent the temperate areas of the world. Eighteen species have been recorded for New Guinea. Seven of the fourteen species in Australia are endemic, whilst three are restricted to Australia and New Guinea. Taxa recorded for New Guinea but not occurring in Australia are:

C. adnata Roxb. var. *montana* Lauterb.: This appears to be an undescribed species, leaf simple, the unicellular 2-armed, rusty-red hairs are densely packed, stipules are large and glabrous.

C. bauerleni Planchon: Leaf simple, glabrous, leaf-base truncate, 3 basal veins, tendrils bifid.

C. conchigera Ridley: Leaf simple, drying dark brown, unicellular 2-armed hairs present on both surfaces as well as on the tendrils, calyx and corolla; the stipules are large and densely pubescent with some longer hairs at the apex, ovary glabrous; hairs on stem usually appear tufted.

C. ledermannii Lauterb.: Leaf simple, pubescent, very similar to the previous species and possibly synonymous.

C. javana DC. (syn. *C. discolor* Blume): Leaf simple, thin, shiny often somewhat iridescent; white markings are sometimes present, sparsely pubescent, stems angular, flowers reddish.

C. nodosa Blume: Leaf simple, glabrous, margins bristle-serrate, tendril unbranched, stems constricted above the node.

C. rhamnoidea Planchon: Leaf simple, membranous, crinkly when dry almost as though it had been overstretched, stem angular.

C. rostrata (Miq.) Korth. ex Planchon: Leaf simple, thin, leaf apex drawn out, acuminate, sparsely pubescent, margins serrate.

C. acrantha Lauterb.: Leaf 3-foliolate, trichomes reddish, unicellular 2-armed, domatia present on mature leaves, margins dentate, flowers white, very small in dense cymes, corolla pubescent.

C. arthroclada Lauterb.: Leaf 3–4-foliolate, petiolules absent or much reduced, synonymous with *C. penninervis* F. Muell.

C. behrmannii Lauterb.: Leaf 3–5-foliolate, trichomes sparse, reddish, unicellular, 2-armed, domatia present, margins entire, pellucid dots often present, inflorescence dark brown, pubescent.

The Australian species fall into three groups distinguished by leaf, and to a lesser extent cotyledon and seed features.

1. In the four taxa with compound leaves, the two cotyledons are similar and lanceolate with entire margins (**Fig. 8F**). There is usually more than one seed per fruit. These taxa are not closely related to each other. *C. sterculiifolia* (F. Muell. ex Benth.) Planchon, which also extends into New Guinea is similar to *C. acrantha* and *C. behrmannii*. Examination of two specimens of *C. arthroclada* [Ledermann 6958 (K) and 10349 (K)] cited by Lauterbach (1925) failed to distinguish this entity from *C. penninervis*.
2. The two taxa which have simple leaves and domatia on the abaxial surface also have similar lanceolate cotyledons with entire margins. There are usually 2–3 ovoid seeds per fruit.

3. Eight taxa have simple leaves without domatia and the fruits contain 1 rarely 2 pisiform or pyriform seeds. The cotyledons in those species examined are unequal in size and shape (**Fig. 5B**). They are obtriangular with a rounded base and the upper margin is irregularly dentate.

The closely related species pairs, *C. antarctica* Vent. and *C. oblonga* (Benth.) Planchon, as well as *C. repens* Lam. and *C. reniformis* Domin, have different habitat preferences. *C. antarctica* and *C. repens* appear to prefer moister habitats such as vine forests, whilst *C. oblonga* and *C. reniformis* may be considered their 'dry' counterparts (Jackes 1984).

Terms used to describe rainforest habitats are those of Webb (1978).

Key to the Species

1. Leaves simple 2
Leaves compound 11

2. Domatia present 3
Domatia absent 4

3. Lower surface of leaves rarely glabrous, hairs 2-armed, distinctly stalked; margins always with some serrations at maturity. Flowers in congested umbels. Length/breadth ratio of seeds 1.1 ± 0.1 . . . . **1. C. antarctica**
Lower surface of leaves usually glabrous, hairs when present 2-armed, closely appressed to the surface; margins usually entire at maturity. Flowers in loose umbels. Length/breadth ratio of seeds 1.4 ± 0.1 **2. C. oblonga**

4. Leaves glabrous. Fresh stems rounded in cross-section, mucilage copious . . 5
Leaves pubescent at least when young. Fresh stems angular in cross-section, mucilage sparse 6

5. Seeds less than 6 mm wide . . . . **3. C. repens**
Seeds more than 6 mm wide . . . . **4. C. reniformis**

6. Leaf length/breadth ratio 1 ± 0.3; undersurface of young leaves green, hairs pale to dark rusty-coloured; leaf-base often reniform or deeply cordate 7
Leaf length/breadth ratio 1.4 ± 0.3; undersurface of young leaves reddish, hairs not obvious; leaf-base cordate to truncate 10

7. Multicellular, uniseriate hairs present on the lower surface of the leaf, predominantly confined to the veins, very small unicellular, 2-armed hairs also present . . . . **5. C. adnata**
Unicellular, 2-armed hairs present on the lower surface of the leaf, multicellular, uniseriate hairs, if present, rare 8

8. Tendrils with 4–5 branches . . . . **6. C. pentaclada**
Tendrils with 1–3, usually 2, branches 9

9. Summit of ovary glabrous or papillose. Stipules usually glabrous. Endotesta thin (Queensland mainland) . . . . **7. C. cardiophylla**
Summit of ovary glabrous. Stipules pubescent. Endotesta thick (Torres Strait) . . . . **8. C. aristata**

10. Stems winged, square in cross-section, glaucous. Tendrils unbranched . . . . **9. C. hastata**
Stems angular in cross-section at least when dry, green. Tendrils bifid . . . . **10. C. vinosa**

11. Flowers 5-merous . . . . **11. C. opaca**
Flowers 4-merous 12

12. Domatia present . . . . **12. C. sterculiifolia**
Domatia absent 13

13. Leaves penninerved, green; petiolules absent or very small . . **13. C. penninervis**
Leaves not penninerved, often glaucous on lower surface; petiolules distinct . . . . **14. C. hypoglauca**

1. Cissus antarctica Vent., Choix pl., 21. t. 21 (1803); DC., Prodr. 1: 629 (1824); Sims, Bot. Mag. t. 2488 (1824).

Cissus antarctica var. *integerrima* Domin, Biblioth. Bot. 89: 366 (1927). **Type:** Tamborine Mountains, 1910, *Domin* 6359 (PR).

Cissus antarctica var. *pubescens* Domin, Biblioth. Bot. 89: 366 (1927). **Type:** Yungaburra, 1910, *Domin* 6360 (PR).

Vitis antarctica Benth., Fl. austral. 1: 447 (1863); Miq. Ann. mus. lugd.-bat. 1: 83 (1863); F.M. Bailey, Queensl. fl. 1: 279 (1899).

Cissus baudiniana Planchon in A. & C. DC., Monogr. phan. 5: 517 (1887).

Vitis baudiniana F. Muell., Fragm. 4: 136 (1864), 5: 212 (1866), 6: 178 (1868); C. Moore, Handb. fl. N.S.W., 213 (1893).

Cissus glandulosa Poiret, Encycl. Suppl. 1: 105 (1810).

Vitis kanguruh Hort. ex DC., Prodr. 1: 629 (1824), nom. inval. in synonomy.

Vitis lucida Fischer ex Steudel, Nomencl. bot. Ed. 2, 2: 778 (1841), nom. inval. in synonomy.

Robust vine, stem rounded, pubescent at least when young, hairs pale grey, occasionally rusty, 2-armed. Tendrils 1–2-fid, often densely pubescent. Plants evergreen. Leaves simple, ovate to oblong, apex acuminate to obtuse, base cordate to truncate, (5.3–)9.6(–14) cm × (3.2–)5.6(–9) cm. Domatia present in the axils of the midribs and lower secondary veins, also common in axils of secondary and tertiary veins. Margins serrate. Upper surface usually glabrous at maturity, lower surface pubescent, hairs unicellular, 2-armed, distinctly stalked. Petiole (1–)2.2(–4) cm long. Stipules triangular, forming a pocket around developing leaf, 5–10 mm × 3–5 mm, pubescent, hairs usually rusty-coloured. Inflorescence umbellate, congested, 1.2–3 cm long, 2–3 primary branches; peduncle 0.5–2 cm long, pubescent. Calyx 0.5–1 mm long, very shortly lobed, papillose. Corolla pale yellow, 1.5–2 mm long, pubescent. Filaments 1 mm long, anthers 0.5 mm long. Ovary glabrous. Berry globular, shiny, black to purplish-black, 8–12 mm × 8–12 mm. Seeds (1–)2–3(–4) per fruit, ovoid, 6–8 mm × 5–7 mm, endotesta often thick; endosperm in transverse section ruminate. Cotyledons similar, lanceolate, margins entire. **Fig. 1A–E.**

Representative specimens examined: Queensland. Cook District: Helenvale, S of Cooktown, Jul 1982, *Jackes* (BRI); Atherton, May 1929, *Kajewski* (A,BRI,K). North Kennedy District: Mount Fox, Dec 1949, *Clemens* (A,BRI,GH,K,L). Leichhardt District: Carnarvon National Park, Jun 1965, *Trapnell & Williams* (BRI). Wide Bay District: Kandanga, Mary Valley, Nov 1933, *White* (A,BRI). Moreton District: Petrie, 18 miles [28.8 km] N of Brisbane, Nov 1931, *Blake* 2847 (BRI,K); Ravensbourne Reserve, 27°22′S, 152°11′E, Dec 1982, *McKenzie* (BRI,CANB,CBG,DNA,JCT,K,L,MEL,QRS). **New South Wales.** North Coast: Macleay River, *Beckler* (MEL); Dorrigo, Feb 1980, *Williams* (BRI,CANB,JCT,QRS). Central Coast: Otford, 20 miles [32 km] N of Thirroul, May 1976, *Coveny* 7685 & *Hind* (NSW). South Coast: Pebbly Beach, 20 km NE of Bateman's Bay, Dec 1969, *Briggs* (NSW). Northern Tablelands: Williams River *ca* 40 miles [64 km] N of Singleton, Feb 1963, *Pullen* 3761 (CANB,L). Central Western Slopes: *ca* 43 km NNE of Merriwa on Merriwa–Willow Tree Road, Jun 1969, *Pickard & Coveny* 1203 (K,NSW).

Specimens from 120 localities were examined.

Distribution and Habitat: This species extends along the east coast of Australia (**Map 3**) where it is chiefly associated with notophyll vine forest or remnants of it. Soils are variable.

Flowering period: Spring to autumn.

Fruiting period: Fruits have been collected throughout the year.

Notes and Observations: Although some individual specimens can be assigned to the two varieties proposed by Domin (1927), there is a continuous intergrade of characters regarding leaf pubescence and indentations of the margin. Leaves vary from almost completely glabrous at maturity to densely pubescent at least on the lower surface.

Although the number and depth of the serrations varies, there are always some present on the margins towards the apex. Specimens grown from the same seed source showed considerable variation with respect to these characters. This evergreen species is closely related to *C. oblonga* from which it can be separated by the presence of the distinctly stalked hairs on the lower surface of the leaves and the serrated margins, although in extreme forms the latter feature may not be readily observed. The basal domatia are relatively flat as against the pouched domatia found in *C. oblonga.*

Common name: This species is often known as "Kangaroo Vine".

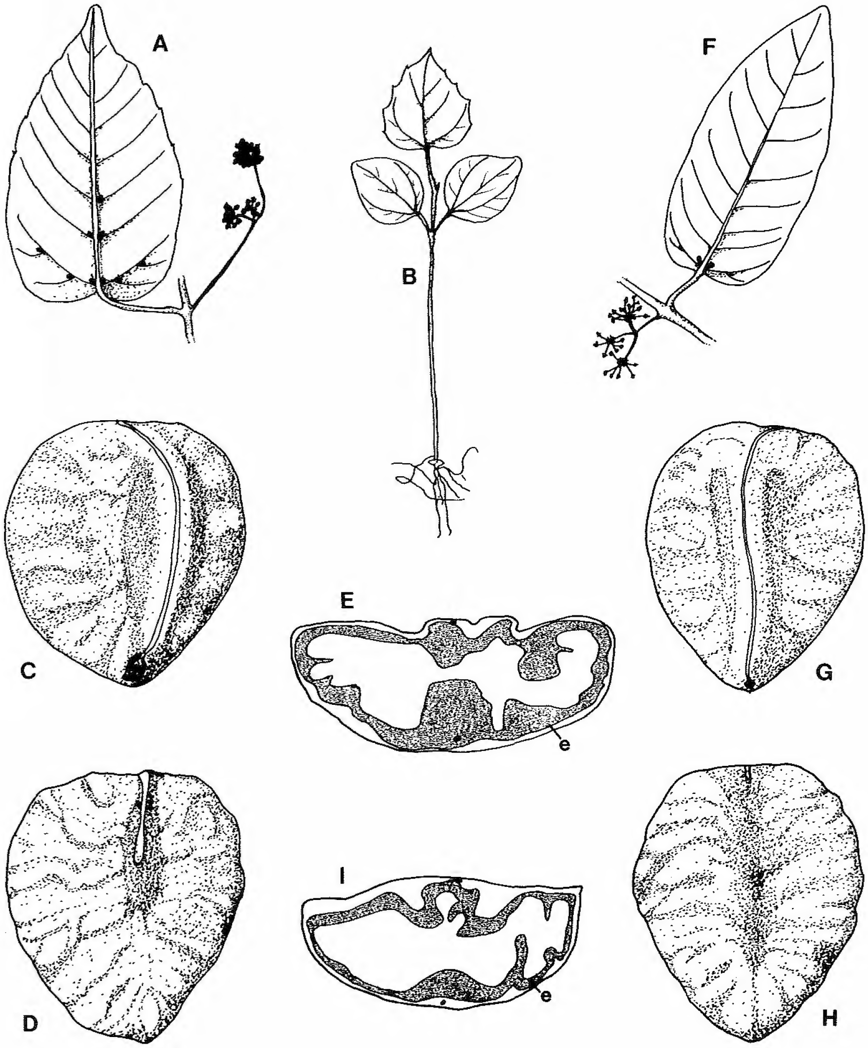

Fig. 1. *Cissus antarctica*: A. Leaf and inflorescence × 0.5. B. seedling × 0.5. C. seed, ventral surface showing position of the raphe × 5. D. seed, dorsal surface showing the position and shape of the perichalaza × 5. E. median T.S. of mature seed × 6. *C. oblonga*: F. leaf and inflorescence × 0.5. G. seed, ventral surface showing position of raphe × 5. H. seed, dorsal surface showing position and shape of perichalaza × 5. I. median T.S. of mature seed × 6. (e – lignified endotesta).

2. Cissus oblonga (Benth.) Planchon in A. & C. DC., Monogr. phan. 5: 517 (1887); Domin, Biblioth. Bot. 89: 366 (1927).

Vitis oblonga Benth., Fl. austral. 1: 447 (1863). **Syntypes:** Broadsound, 12 Sep 1802, *Brown* 5236 (BM,E,K); Curtis Island, *Henne* (K). F. Muell., Fragm. 4: 136 (1864), 6: 178 (1868), 9: 125 (1875); F.M. Bailey, Queensl. fl. 1: 279 (1899).

Vine often scrambling, stems rounded, pubescent, hairs grey, unicellular, 2-armed, closely appressed to stem. Tendrils rarely branched, pubescent. Plants deciduous. Leaves simple, oblong to oblong-ovate, apex obtuse to acute occasionally retuse, base truncate or shallowly cordate, (6–)7.6(–11) cm × (2.6–)3.3(–5.2) cm. Hooded domatia present in axils of midrib and basal pair of secondary veins, also often in axils of lower secondary and tertiary veins. Margins entire or rarely shallowly serrated towards the apex. Upper surface of mature leaf glabrous, rarely pubescent, lower surface glabrous or with scattered unicellular, 2-armed hairs closely appressed to the surface. Petiole usually glabrous, (1.3–)1.8(–2.7) cm long. Stipules triangular, forming a pocket around developing leaf, 3–12 mm × 2.5–3 mm, pubescent, hairs 2-armed, light grey to pale rusty. Inflorescence umbellate, not congested, 1.5–2.2 cm long, 2–3 primary branches; peduncle 0.3–0.9 cm long, pubescent. Calyx 0.75–1 mm long, papillose. Corolla greenish, 1–1.5 mm long, pubescent. Filaments 0.75 mm long, anthers 0.5 mm long. Ovary glabrous. Berry globular, shiny, black to purplish-black, 10–12 mm diameter. Seeds (1–)3(–4) per fruit, ovoid, 7–9 mm × 5–6 mm, endotesta thick; endosperm ruminate. Cotyledons similar, lanceolate, margins entire. **Fig. 1F–I.**

Representative specimens examined: Queensland. Cook District: Shipton's Flat between Rossville and Mount Finnegan, SW of Cooktown, 15°47′S, 145°13′E, Jun 1973, *Webb & Tracey* 10849 (BRI); State Forest Reserve 607, 17°00′S, 145°30′E, May 1971, *Hyland* 5037 (BRI,CANB,K,L,QRS). North Kennedy District: Hervey's Range, Townsville, Feb 1977, *Winsor* (BRI,CBG); 11 miles [17.6 km] NW of Low Holm Station, Jul 1954, *Speck* 4608 (BRI,CANB,K,NT). South Kennedy District: Upper Carmila Creek, S of Sarina, Jun 1965, *Webb & Tracey* (BRI). Leichhardt District: Springsure, Jun 1915, *Bick* (BRI). Wide Bay District: Goodnight Scrub, *ca* 65 km SW of Bundaberg, Jun 1957, *Smith* (A,BRI,K,L).

Specimens from 48 localities were examined.

Distribution and Habitat: This Queensland species is usually found (**Map 2**) in deciduous and semi-evergreen vine thickets, where it is often scrambling or climbing over rocks and associated vegetation. Although occasionally found growing amongst rocks in open woodland, it has rarely been recorded in vine forest. Soils are variable.

Flowering period: Spring and summer.

Fruiting period: Collections have been made throughout the year.

Notes and Observations: This deciduous species may be considered the 'dry' counterpart of *C. antarctica* which occurs in or on the margins of vine forest but not in vine thickets or open woodland. *C. oblonga* is characterized by: leaves either glabrous or the scattered hairs are closely appressed to the surface; as well the margins are usually entire; raised pouch-like domatia, and the loose umbels of the inflorescence.

3. Cissus repens Lam., Encycl. 1: 31 (1783); based on *Nerium Pulli* Rheede, Hort. malab. 7: 91, t. 48 (1688). DC., Prodr. 1: 628(1824); Planchon in A. & C. DC., Monogr. phan. 5: 504 (1887); Domin, Biblioth. Bot. 89: 366 (1927).

Vitis repens Wight and Arnott, Prodr. fl. penin. Ind. or. 1: 125 (1834); Wall. Cat. No. 5990 (1831–32) based on No. 5990 a–f (K-Wall.).

Cissus cordata Roxb., Fl. ind. 1: 425 (1820).

Vitis cordata Wall. Cat. No. 6001 (1831–32), based on No. 6001 a (K-Wall.).

Vigorous vine, stems succulent, dark green, often reddish when young, occasionally glaucous, glabrous, when dry fragile and usually constricted above the node. Tendrils unbranched, glabrous. Plants rarely completely deciduous. Leaves simple, broadly ovate, apex acuminate, base truncate, (6.7–)11.3(–14.5) cm × (4.5–)8.7(–12.5) cm. Margins bristle-serrate. Upper and lower surfaces glabrous. Petiole (1.7–)5.2(–8.2) cm long, glabrous. Stipules triangular with gibbous centre, 2–2.5 mm × 1.5–2 mm. Inflorescence umbellate, loose, 2–8.5 cm long, 2–3 primary branches; peduncle 0.8–7 cm long, pale, cylindrical, 2-armed papillae present; pedicel straight or slightly curved. Calyx 0.75–1 mm long, margin papillose. Corolla yellowish green to white or sometimes with a reddish

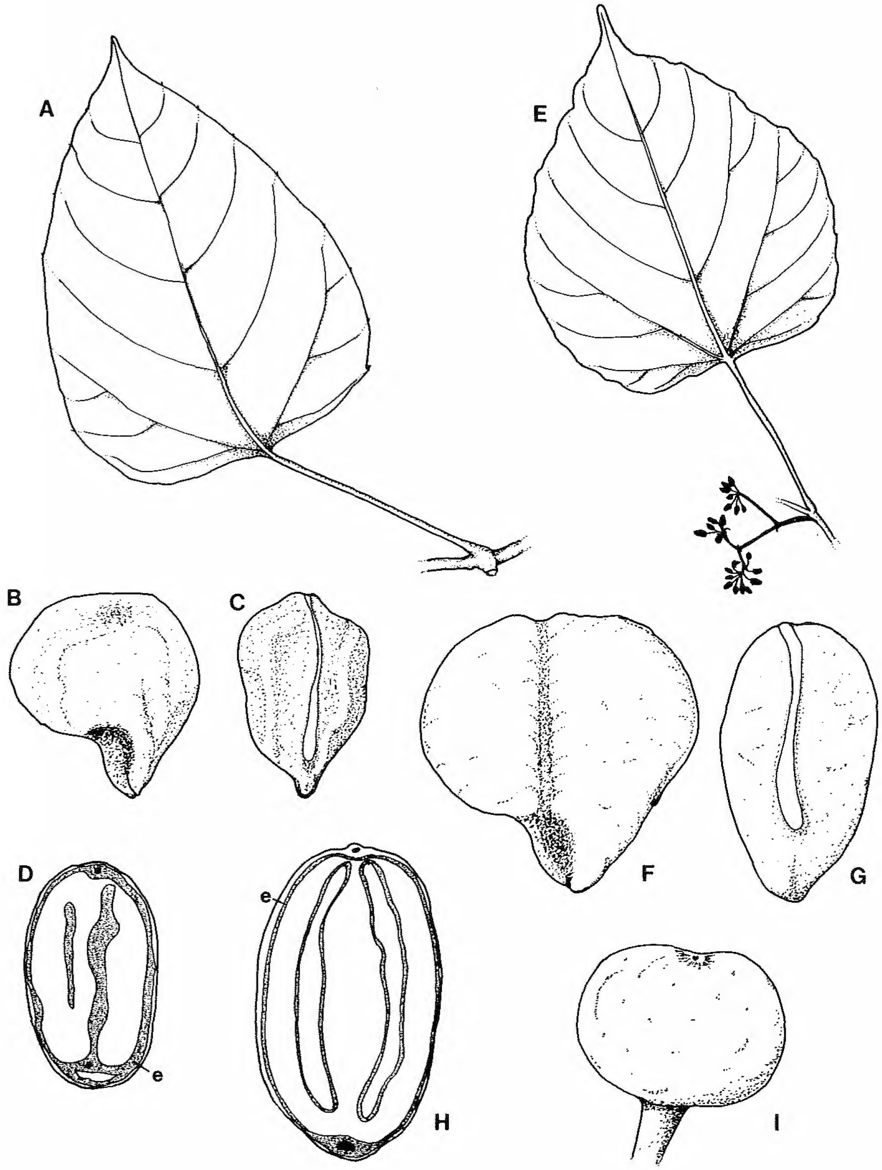

Fig. 2. *Cissus repens*: A. leaf × 0.5. B. seed, lateral surface × 5. C. seed, dorsal surface, showing the position and shape of the perichalaza × 5. D. median T.S. of mature seed × 6. *C. reniformis*: E. leaf and inflorescence × 0.5. F. seed, lateral surface showing groove × 5. G. seed, dorsal surface showing position and shape of perichalaza × 5. H. median transverse section of mature seed × 6. I. fruit × 2. (e – lignified endotesta).

tinge, 2–3 mm × 1–1.5 mm, glabrous. Filaments 1–1.5 mm long, anthers 0.5–0.75 mm long. Ovary glabrous, style filiform. Berry ovoid, black, 7–9 mm × 6–6.5 mm. Seed 1 per fruit, pyriform, 6–6.5 mm × 5–5.5 mm; endosperm in transverse section usually almost twice divided by the thin endotesta. **Fig. 2A–D.**

Representative specimens examined: Queensland. COOK DISTRICT: Badu Island, Torres Strait, Dec 1976, *Cameron* 2668 (QRS); Near tip of Cape York, 10°42′S, 142°33′E, Mar 1984, *Jackes* (A,BRI,CANB,K,L,NSW); Claudie River, Feb 1984, *Garnett* (BRI,CANB); Danbulla, 17°10′S, 145°35′E, Jan 1976, *Gray* 134 (QRS). NORTH KENNEDY DISTRICT: near Tully, 17°47′S, 145°42′E, Mar 1980, *Jackes* (BISH,DNA,JCT,MO,NE,PERTH,QRS); Fanning River, 19°43′S, 146°26′E, Dec 1978, *Jackes* (A,BRI,CANB,JCT,K,L,NSW,QRS).

Specimens from 18 Australian localities were examined.

Distribution and Habitat: This species extends from India to New Guinea and Australia. In North Queensland (**Map 5**) it usually occurs in vine forest or evergreen thicket, often on rocky hillsides although it has been collected on beach ridges.

Flowering period: Summer to early winter.

Fruiting period: Summer to winter.

Notes and Observations: This species is easily distinguished from all but *C. reniformis* by the glabrous leaves and the copious mucilage in the fresh stems. It differs from the latter by habitat preference; it is rarely deciduous and does not appear to form tubers; the non-senescing leaves are usually dark green rather than light green; in Australian specimens the leaf-base is never reniform; length/breadth ratio of the leaves is 1.4 ± 0.3 as against 1 ± 0.3, and the seed is smaller. Exposed specimens often exhibit marked anthocyanin development.

4. Cissus reniformis Domin in Feddes, Repert. 11: 263 (1912). **Syntypes:** North Coast, *Brown* (MEL); Gulf of Carpentaria, Jan 1803, *Brown* 5237 (BM,E,K). Domin, Biblioth. Bot. 89: 367 (1927).

Vigorous vine, stems succulent, pale green or tinged with red, glabrous; when dry, often angular or striate, fragile, often constricted above the node. Tendrils unbranched, glabrous. Plants deciduous, tuber present. Leaves simple, broadly ovate, apex acuminate, base truncate to reniform, (8–)10.5(–15) cm × (7.6–)8.4(–13) cm. Margins serrulate to crenate-serrulate, bristle-like projections sometimes present when young. Upper and lower surfaces glabrous, veins usually prominent on lower surface. Petiole (1–)4.4(–7) cm long, glabrous. Stipules triangular with gibbous centre, 2–3 mm × 1.5–2 mm. Inflorescence umbellate, loose, 3–4 cm long, (2–)3(–4) primary branches, glabrous; peduncle 0.5–1.5 cm long; pedicel straight or curved. Calyx truncate, expanded membranous, 0.75–1 mm long, margin papillose. Corolla reddish, 2 mm × 1–1.5 mm, glabrous. Filaments 1–1.2 mm long, anthers 0.5 mm long. Disc thick, spreading. Ovary glabrous, style filiform. Berry globular to depressed-globular, black, 7–9 mm × 5–8 mm. Seeds 1 rarely 2–3 per fruit, pyriform, 7–7.5 mm × 6.5–7.5 mm, groove present on a lateral side; endosperm in transverse section almost twice divided by the thin endotesta. Cotyledons dissimilar. **Fig. 2E–I.**

Representative specimens examined: Northern Territory. Whitestone Creek, 12°32′S, 131°28′E, Nov 1978, *Rankin* 1583 (BRI,DNA,JCT,K); Mount Brockman, Koongarra Jump Up, 12°51′S, 132°52′E, Dec 1977, *Dunlop* 4627 (BRI,CANB,DNA,K,L,NT,JCT); Deaf Adder Gorge, 13°02′S, 133°05′E, Feb 1977, *Fox* 2523 (BRI,CANB,DNA,NT); *ca* 20 km from coast on Woolaning–Channel Point road N of Daly River, 13°15′S, 130°10′E, May 1978, *Webb & Tracey* 12220 (BRI). **Queensland.** COOK DISTRICT: head of Peach Creek, McIlwraith Range, *ca* 13°46′S, 143°6′E, Oct 1969, *Webb & Tracey* 9757 (BRI); Base of Black Mountain, SW of Cooktown, Dec 1965, *Rodd* 215 (NSW); Edward River, 14°54′S, 141°36′E, Mar 1981, *Garnett* (BRI,CANB,DNA,JCT,K,L,MO,NSW,QRS). BURKE DISTRICT: Lawn Hill, NW of Mount Isa, *Gittons* (BRI). NORTH KENNEDY DISTRICT: Barrabas Scrub, 20°10′S, 146°45′E, May 1972, *Hyland* 6109 (QRS). SOUTH KENNEDY DISTRICT: Middle Percy Island, Mar 1906, *Tryon* (BRI).

Specimens from 47 localities were examined.

Distribution and Habitat: This species is commonly found (**Map 6**) in deciduous vine thickets or monsoon forests growing over rocky outcrops and beach ridges; it is rarely found in notophyll vine forest.

Flowering period: Spring and summer.

Fruiting period: Summer and autumn.

Notes and Observations: This species is superficially very similar to *C. repens* with its glabrous leaves and succulent, fresh stems which produce copious mucilage when broken. Likewise dry stems are often constricted above the node and easily fractured. However plants are dry season deciduous and tubers form even in young seedlings. Leaves are green to light green in colour, often with pale veins which are prominent on the lower surface. The leaf-base which is initially truncate, usually becomes reniform at maturity. The larger seed usually has a groove present on a lateral side (**Fig. 2F**). Collecting notes sometimes record the fruit as white, however observations indicate that fully expanded but immature fruit are pale-coloured and that the colour change to black appears to occur within one or two days.

5. **Cissus adnata** Roxb., Fl. ind. 1: 405 (1820); DC., Prodr. 1: 627 (1824); Planchon in A. & C. DC., Monogr. phan. 5: 494 (1887); Domin, Biblioth. Bot. 89: 367 (1927).

Vitis adnata Wight & Arnott, Prodr. fl. penin. Ind. or. 1: 126 (1834); Wall. Cat. No. 5998 (1931–32) based on No. 5998 c,d,f,g (K-Wall.); Benth., Fl. austral. 1: 448 (1863); F. Muell., Fragm. 6: 178 (1868); F.M. Bailey, Queensl. fl. 1: 280 (1899).

Cissus wightii Planchon in A. & C. DC., Monogr. phan. 5: 478 (1887). **Type:** Quilon, Jun 1830, *Wight* 496 (K).

Vine, sometimes scrambling, stems angular, bark often reddish, flaky, pubescent when young, hairs uniseriate, 8–12-celled. Tendrils usually unbranched occasionally bifid, often bearing scattered uniseriate hairs. Plants deciduous. Leaves simple, membranous, orbicular to broadly ovate, apex acuminate to cuspidate, base cordate to reniform, (9–)12.2(–18) cm × (10–)13(–19) cm. Margins bristle-serrate, veins prominent, secondary veins terminate in hair-like projections which extend beyond the margin. The uniseriate 8–12-celled hairs on the upper surface are chiefly associated with the veins at maturity, often glabrous when old. Lower surface pubescent, concentrated along the veins, hairs both uniseriate, multicellular and unicellular, 2-armed. Petioles (3–)5.2(–8) cm long, glabrous. Stipules rounded-triangular with gibbous centre, glabrous, *ca* 3.5 mm × 2 mm. Inflorescence umbellate, loose, *ca* 2.5–7 cm long, 3–5 primary branches, pubescent; peduncle (1–)2.7(–5) cm long, pubescent; pedicel curved, pubescent. Calyx 1 mm long, papillose. Corolla pale green to white, 1–1.5 mm × 0.75–1.5 mm, often papillose. Filaments 0.75 mm long, anthers 0.5 mm long. Disc with 4 small lobes. Ovary crowned by uniseriate hairs. Style conical, 0.5–1 mm long. Berry pyriform, dark brown to black, 4.5–7 mm × 4–7 mm. Seed 1 per fruit, rounded, 4–6 mm × 3.5–5.5 mm; endosperm in transverse section twice divided by the thin endotesta. **Fig. 3A–D.**

Representative specimens examined: Western Australia. The Gorge, Station Creek, 35 km NNE of Carlton Hills Homestead, Kimberleys, Mar 1978, *Lazarides* (CANB,K,NT); Augustus Island, Bonaparte Archipelago, 15°25′S, 124°35′E, May 1972, *Wilson* (PERTH); Sheba Hills, N of Geikie Gorge, Fitzroy Crossing, May 1905, *Brown* 1064 (PERTH). **Northern Territory.** Wessel Islands, 11°19′S, 136°36′E, Oct 1972, *Latz* 3496 (BRI,CANB,L,NT); ESE of Mudginberry, 12°36′S, 132°58′E, Feb 1973, *Dunlop* 3289 (BRI,K,CANB); Deaf Adder Gorge, 13°02′S, 132°58′E, Feb 1977, *Fox* 2517 (CANB,JCT); Woolanging–Channel Point Road, N of Daly River, 13°15′S, 130°10′E, May 1978, *Webb & Tracey* 12225 (BRI). **Queensland.** COOK DISTRICT: "Wilderness Lodge" tip of Cape York, Mar 1984, *Jackes* (A,K); *ca* 21 km N of Aurukun, Dec 1981, *Clarkson* (BRI,JCT,QRS); Cairns, Jun 1897, *Nugent* 105 (BRI).

Specimens from 33 Australian localities were examined.

Distribution and Habitat: This species extends from India to New Guinea and into tropical Australia, where it occurs north of 18°S (**Map 7**). Habitats range from semi-deciduous vine thickets adjacent to beach rubble through to monsoon forests and notophyll vine forests, usually on well-drained soils. Soils are variable but are usually sands or sandy loams, sometimes lateritic, sometimes calcareous.

Flowering period: Spring to summer.

Fruiting period: Summer to autumn.

Notes and Observations: As discussed by Jackes (1987a) *C. adnata* has been frequently misidentified, however the taxon is readily recognised by the presence of multicellular, uniseriate hairs which are predominantly confined to the veins on the lower epidermis of the leaf; the bristle-serrate margins; hairs on top of the ovary and the glabrous stipules.

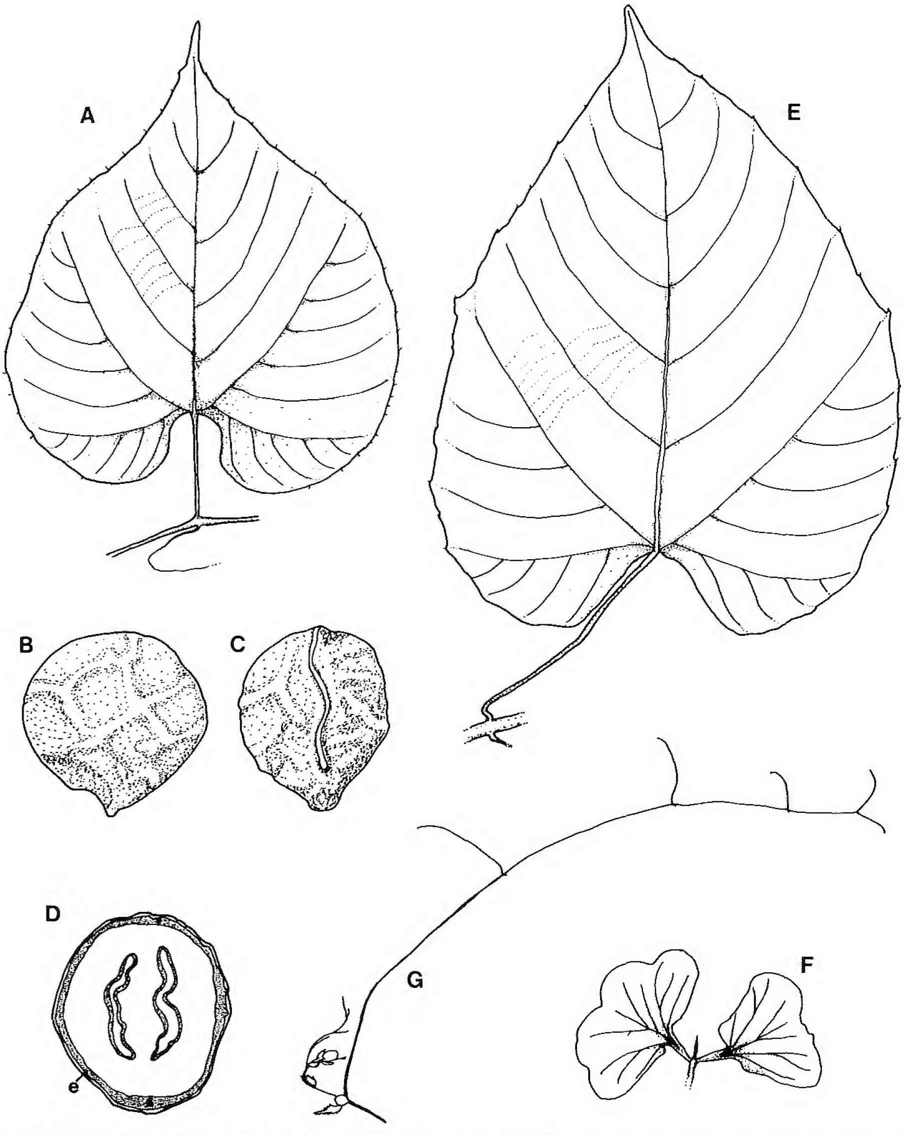

Fig. 3. *Cissus adnata*: A. leaf × 0.5. B. seed, lateral surface × 5. C. seed, dorsal surface showing position and shape of perichalaza × 5. D. median T.S. of mature seed × 6. *C. pentaclada*: E. leaf × 0.5. F. cotyledons × 0.5. G. branched tendril and young shoot × 0.5 (e – lignified endotesta).

6. Cissus pentaclada B.R. Jackes **sp. nov.** affinis *C. aristata* Blume pilis apice ovarii, capreolatis 4–5-fidis distinguenda. **Typus:** Little Stewart Creek, 14°05′S, 143°17′E, 14 November 1980, *Hyland* 21130V, "Rainforest, vine growing by tendrils, 8 cm diameter. Outer surface fissured, flaky, corky. Vas. rays obvious in the wood and the vessels are in radial lines" (holo: QRS 062524; iso: JCT,QRS).

Vigorous vine climbing or sometimes clinging to trees, stems rounded, somewhat succulent, pubescent, hairs pale, unicellular, 2-armed. Tendrils 4–5-fid, sparsely pubescent, ends of branches sometimes forming adhesive discs. Plants deciduous. Leaves simple, broadly ovate, apex acuminate to cuspidate, base cordate, (6.2–)9(–13) cm × (5.8–)9(–13.5) cm. Margins irregularly serrate often tipped by bristles. Upper surface sparsely pubescent, lower surface pubescent; hairs on both surfaces pale-coloured, unicellular, 2-armed; multicellular, uniseriate hairs confined to main veins, uncommon at maturity. Petiole (1–)5.7(–10) cm long, pubescent. Stipules obovate, with gibbous centre, pubescent, 3–4 mm × 1.5–2.5 mm. Inflorescence umbellate, 5–9 cm long; 3–4 primary branches, pubescent; peduncle 3.5–6.5 cm long, pubescent; pedicel papillose, straight or curved. Calyx 0.5–0.75 mm long, sparsely pubescent. Corolla reddish, 2 mm × 1–1.5 mm, hairs present near apex on dorsal surface. Filaments 1 mm long, anthers 0.5 mm long. Ovary pubescent, 1 mm long, style conical, 1 mm long. Berry globular, black, 7 mm × 6 mm. Seed 1 per fruit, pyriform, 6 mm × 5 mm; endosperm in transverse section appears almost twice divided by the endotesta. Cotyledons dissimilar. **Fig. 3E–G.**

Representative specimens examined: Queensland. COOK DISTRICT: SE side of Prince of Wales Island, Torres Strait, 10°45′S, 142°15′E, Feb 1975, *Cameron* (QRS); Carnegie Range, Cape York, 10°42′S, 142°32′E, Apr 1984, *Jackes* (A,BRI,CANB,JCT,K,L,NE,NSW,QRS); Few km S of Weipa School, May 1978, *Webb & Tracey* 12227 (BRI); Lankelly Creek, 13°53′S, 143°16′E, Oct 1980, *Hyland* 21118V (QRS); Little Stewart Creek, 14°05′S, 143°17′E, Nov 1980, *Hyland* 21130V (JCT,QRS); York, Jul 1980, *Murray* (BRI,CANB); *ca* 6 km W of Lakeland Downs, Jan 1985, *Johnson* (A,BRI,CBG,CANB,DNA,JCT,K,L,MEL,NSW).

Specimens from 16 localities were examined.

Distribution and Habitat: Confined to Cape York Peninsula (**Map 1**), this species is usually found climbing over the adjacent vegetation or clinging to trees by adhesive discs on the ends of the tendril branches. It may be found in gallery forest, in vine forest, and along creeks in open woodland. Soils are variable.

Flowering period: Summer.

Fruiting period: Summer.

Notes and Observations: This species is readily distinguished by the 4–5-fid tendrils and the irregularly serrate leaf margins.

Etymology: The specific epithet refers to the number of tendril branches most frequently found.

7. **Cissus cardiophylla** (F. Muell.) B.R. Jackes, **comb. nov.** Based on *Vitis cardiophylla* F. Muell., Fragm. 2: 73 (1861). **Type:** Rockhampton, *Thozet* (MEL 540180) labelled *Vitis cordata*. F. Muell., Fragm. 5: 210 (1866), 6: 178 (1868), 9: 126 (1874).

Vitis cordata Benth., Fl. austral. 1 :447 (1863); F.M. Bailey, Queensl. fl. 1: 279 (1899).

Cissus muelleri Planchon in A. & C. DC., Monogr. phan. 5: 516 (1887). **Syntypes:** Queensland, district of Kennedy, *Mueller* (MEL); Hodjkinson River, *Gulliver* 204 (MEL); Rockingham Bay, *Dallachy* (MEL). Domin, Biblioth. Bot. 89: 367 (1927).

Vine climbing or scrambling, stems angular, pubescent, hairs pale to rusty, unicellular, 2-armed. Tendrils with (1–)2(–3) branches, pubescent when very young. Plants usually deciduous. Leaves simple, orbicular sometimes slightly lobed, apex obtuse to acute, base cordate to reniform, (5–)8.3(–11) cm × (6.5–)9.4(–12.2) cm. Margins crenate to serrulate. Upper and lower surfaces pubescent, hairs mainly unicellular, 2-armed, asymmetrical; uniseriate, erect 7–9-celled hairs sometimes present, early deciduous except at vein junctions, rusty-red. Petiole (1.5–)3.9(–6.8) cm long. Stipules triangular usually carried at right angles to the stem, scattered hairs sometimes present when young, 2–4.5 mm × 1.5–2.5 mm. Inflorescence umbellate, loose, pubescent, 2.5–7 cm long, 3–5 primary branches; peduncle (1.5–)1.8(–4) cm long; pedicel straight or curved, papillose. Calyx 1 mm long, glabrous. Corolla yellowish-green to white, 1.5–3.5 mm × 1–1.5 mm, glabrous or occasionally papillose. Filaments 1–1.5 mm long, anthers 0.5–0.75 mm long. Ovary glabrous or papillose, style conical, 1–1.5 mm long. Berry pyriform, black, 5–6 mm × 4–5 mm. Seed 1 per fruit, pyriform; endosperm in transverse section almost twice divided by the thin endotesta. Cotyledons dissimilar. **Fig. 4A–E.**

Representative specimens examined: Queensland. COOK DISTRICT: Chillagoe, *Godwin* C 432 (BRI,JCT). BURKE DISTRICT: Porcupine Gorge, N of Hughenden, May 1983, *Garnett* (A,MO). NORTH KENNEDY DISTRICT: Black Rock, 16 miles [25.6 km] S of Lynd Junction on Hann Highway between Hughenden and Mount Garnet, *ca* 19°05′S, 144°25′E, May 1970, *Webb & Tracey* 10164 (BRI); Sandy Cape and Port Bowen, 1842, *Macgillivray* 58 (BM); 10 km NE of Collinsville on Bowen Road, 20°29′S, 147°52′E, Jan 1978, *Jackes* (A,BRI,CANB,CBG,DNA,JCT,K,L,MEL,MO,NSW,PERTH,QRS). SOUTH KENNEDY DISTRICT: Hayman Island, Jun 1934, *White* 10076 (BRI,MO). PORT CURTIS DISTRICT: Rockhampton, 1863–1865, *Dietrich* 419 (BM,MO).

Specimens from 31 localities were examined.

Distribution and Habitat: This species is found (**Map 1**) scrambling over rocks or trees in open woodland and deciduous vine thickets. It has been collected on granite, basalt and limestone outcrops.

Flowering period: Summer to autumn.

Fruiting period: Summer to autumn.

Notes and Observations: The identity of this species has frequently been confused, even by Mueller himself, as later collections identified as either *Vitis cordata* or *V. cardiophylla* have also included specimens of *Cissus hastata* [Rockingham Bay, *Dallachy* (MEL); Rockhampton, *O'Shannesy* 216 (MEL)].

C. muelleri is based on mixed types. The only specimen marked Kennedy District in Melbourne is *C. cardiophylla* but the specimen collected by *Dallachy* (MEL) is *C. hastata*. Gulliver 204, collected on the Hodjkinson River, could not be located in Melbourne.

This species is easily distinguished from the other mainland species by the shape of the leaves which bear unicellular, often rusty-coloured 2-armed hairs and the (1–)2(–3)-fid tendrils.

8. Cissus aristata Blume, Bijdr. 183 (1825). **Type:** *Blume* (L 897345287).

Cissus simplex Blanco, Fl. de Filip. 72 (1837).

Cissus pyrrhodasys Miq., Fl. Ned. Ind., Eerste bijv. 1: 517 (1860). **Type:** Sumatra, *Diepenhorst.*

Vitis pyrrhodasys (Miq.) Ridley, J. Straits Branch Roy. Asiat. Soc. 23: 75 (1917).

Cissus assamica (Lawson) Craib var. *pilosissima* Gagnepain, Notul. Syst. (Paris) 1: 353 (1911). **Syntypes** (seen): Java, *Forbes* 1111 & 1036 (P); New Guinea, *Hollrung* 419 (P); Bengal, *Griffith* 1311 (K).

Vitis adnata Wall. Cat. No. 5998 (1831–32) based on No. 5998 a,b,e,h,j, (K-Wall.).

Robust vine, stem angular, densely pubescent, hairs unicellular, 2-armed often dark-coloured, arms long often much twisted. Tendrils 2–3-fid, pubescent. Plants evergreen. Leaves broadly ovate to orbicular, apex acuminate to aristate, base cordate or often truncate when immature, (6–)8(–12) cm × (4–)6.8(–12) cm. Margins serrate, irregularly serrate or bristle-serrate. Both surfaces pubescent, upper surface often becoming glabrous with age; lower surface may be densely pubescent, hairs unicellular 2-armed, dark-coloured. Petiole (1.5–)2(–2.5) cm long, pubescent. Stipules obovate, pubescent, 4 mm × 4 mm. Inflorescence umbellate, terminal umbels congested, 4–5 cm long, 4–5 primary branches; peduncle 2–2.5 cm long; pedicels straight or curved. Calyx spreading, 1 mm long, papillose. Corolla yellowish green to yellow, 1.5–2 mm long, papillose. Filaments 1 mm long, anthers 0.5 mm long. Ovary glabrous. Berry globular to pyriform, black, 5–8 mm × 5–8 mm. Seeds 1 rarely 2 per fruit, pyriform, 4.5 mm × 3 mm; endosperm in transverse section W-shaped. **Fig. 4F–I.**

Representative specimens examined: Queensland. COOK DISTRICT: Mount Cornwallis, Dauan Island, 9°26′S, 142°32′E, Oct 1981, *Clarkson* (BRI,JCT).

Specimens from 1 Australian locality were examined.

Distribution and Habitat: This species, widespread throughout Asia and New Guinea, has now been collected in the Torres Strait (**Map 6**). Here it was recorded as growing on "a steep boulder strewn hillside carrying a depauperate closed forest".

Flowering period: Spring and summer.

Fruiting period: Spring and summer.

Notes and Observations: This species is readily distinguished by the dark-coloured, 2-armed hairs with much twisted arms, the glabrous ovary and the pubescent stipules. The leaves often dry dark brown.

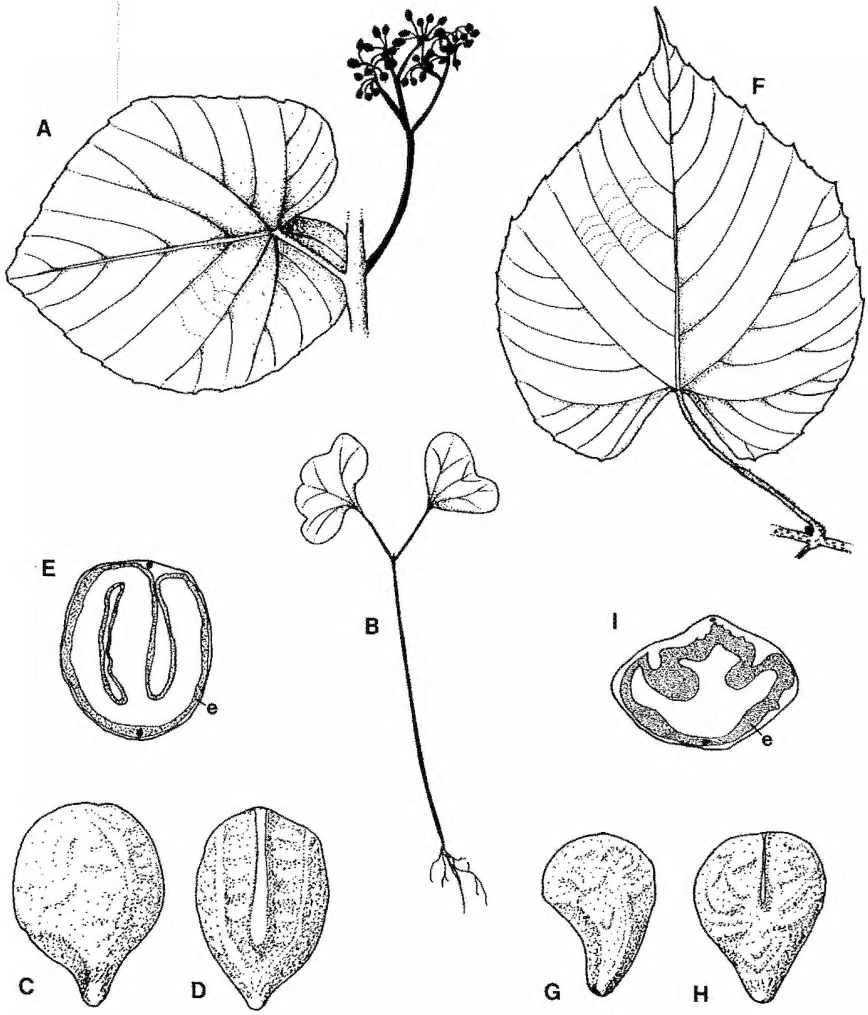

Fig. 4. *Cissus cardiophylla*: A. leaf and inflorescence × 0.5. B. seedling × 0.5. C. seed, lateral surface × 5. D. seed, dorsal surface showing position and shape of perichalaza × 5. E. median T.S. of mature seed × 6. *C. aristata*: F. leaf × 0.5. G. seed, lateral surface × 5. H. seed, dorsal surface showing position and shape of perichalaza × 5. I. median T.S. of mature seed × 6. (e – lignified endotesta).

9. Cissus hastata Miq., Fl. Ned. Ind., Eerste bijv. 1: 517 (1860). **Type:** Sumatra, *Diepenhorst.* Planchon in A. & C. DC., Monogr. phan. 5: 502 (1887).

Vitis hastata Miq., Ann. mus. lugd.-bat. 1: 85 (1863).

Vitis sagittifolia M. Lawson, Fl. Brit. India 1: 645 (1875). **Type:** Wall. Cat. No. 5991 (K-Wall.).

Vine, stems quadrangular, margins winged, glaucous, hairs unicellular, 2-armed, closely appressed to the surface. Some small uniseriate 1–5-celled hairs may be present on very young stems. Tendrils unbranched in Australian specimens. Plants evergreen. Leaves simple, ovate to broadly-ovate, often reddish on the lower surface when young, apex acute to acuminate, base cordate, (7–)9.4(–11.5) cm × (5.3–)7.4(–10.5) cm. Margins serrulate. Upper and lower surfaces bear unicellular, 2-armed hairs when young. Petiole (1.6–)2.9(–4.2) cm long, both uniseriate and unicellular 2-armed hairs may be present.

Stipules triangular, 1.5–2.5 mm × 1.5–2 mm, borne at right angles to the stem. Inflorescence umbellate, 2–3.5 cm long, 3 primary branches, pubescent; peduncle 0.6–1.2 cm long, hairs both 2-armed and uniseriate; pedicel straight or curved. Calyx truncate, 0.5–0.75 mm long. Corolla white to yellowish, 1.5–2 mm × 1–1.5 mm, glabrous. Filaments 1 mm long, anthers 0.5–0.75 mm long. Ovary glabrous. Berry globular, black, 6–7 mm × 4–6 mm. Seed 1 per fruit, pyriform, 4–4.5 mm × 3–4 mm; endosperm in transverse section appears almost twice divided by the endotesta. Cotyledons dissimilar. **Fig. 5A–E.**

Representative specimens examined: Queensland. COOK DISTRICT: Tor Hill, E of Falls Creek crossing with Kennedy Road, 15°55′S, 143°03′E, Jun 1982, *Morton* 1729 (CANB,JCT); McIlwraith Range, N of Coen, 1962, *Webb & Tracey* (BRI); Freshwater Creek near Cairns Intake, May 1962, *Blake* 21726 (A,BRI,K,L,NSW); State Forest Reserve 185, 17°09′S, 145°33′E, Jan 1981, *Gray* 20149V (JCT,QRS); Barnard Islands, 1848, *Macgillivray* (BM,K). NORTH KENNEDY DISTRICT: Bingil Bay, 17°50′S, 146°06′E, Dec 1978, *Jackes* (A,BISH,BRI, CANB,CBG,DNA,JCT,K,L,MEL,MO,NSW,PERTH,QRS); Rockingham Bay, Nov 1867, *Dallachy* (MEL). SOUTH KENNEDY DISTRICT: Northumberland Islands, *Brown* 5238 (BM,K); Goldsmith Island, Aug 1986, *Melville* (JCT). PORT CURTIS DISTRICT: Rockhampton, *Dietrich* (PR).

Specimens from 34 Australian localities were examined.

Distribution and Habitat: This species which also occurs from India through to New Guinea and Australia is found along the eastern coast of Queensland (**Map 8**) where it is usually cascading over trees on the edges of vine forest, from sea level to 700 m. Soils are variable.

Flowering period: Summer to winter.

Fruiting period: Summer to winter.

Notes and Observations: This species which does not appear to become a robust vine, is readily distinguished by its glaucous, quadrangular winged stems. Although bifid tendrils are common on extra-Australian specimens, all plants and specimens examined in Australia had unbranched tendrils.

10. Cissus vinosa B.R. Jackes **sp. nov.**, affine *C. repente* Lam., foliis solidis pilos unicellulates 2-ramosos juventute ferentibus, capreolis bifidis, endotests seminis convolutissima differt. **Typus:** 15 km E of Wallaman Falls, 18°36′S, 145°50′E, 15 November 1986, *B.R. Jackes* 8612, "Vigorous vine in rainforest. Young shoots and leaves burgundy-coloured. Flowers greenish-white. Soils red loam". (holo: BRI; iso: A,BISH,CANB,CBG,DNA,JCT,K,L,MEL,MO,NE,NSW,PERTH,QRS).

Robust vine, stems angular, pubescent when young particularly at the nodes, hairs unicellular, 2-armed. Tendrils bifid, scattered hairs present when young. Plants evergreen. Leaves simple, firm, drying grey, ovate, apex acuminate, base truncate or weakly cordate, (9–)13.2(–21) cm × (6–)8.6(–13) cm. Margins serrulate. Upper and lower surfaces usually glabrous at maturity, unicellular 2-armed hairs present when young. Petiole (2.5–)3.2(–4) cm long, often pubescent. Stipules triangular, rounded at the apex, 3–4 mm × 2 mm. Inflorescence umbellate, 5.5–6.5 cm long, 3–4 primary branches, pubescent; peduncle 2–3.5 cm long, scattered unicellular, 2-armed hairs present; pedicel straight. Calyx truncate, 0.75–1.5 mm long. Corolla greenish-white to yellowish, 2–3 mm × 1–1.5 mm. Filaments 1.5–2 mm long, anthers 0.75 mm long. Ovary angular (squarish), glabrous, disc inconspicuous, style conical. Berry globular, black, 6–8 mm × 5–7 mm. Seeds 1 rarely 2 per fruit, pyriform, 5–7 mm × 4–6 mm; endosperm in transverse section broken up by the convoluted endotesta. **Fig. 5F–I.**

Representative specimens examined: Queensland. COOK DISTRICT: Rainforest of Range Road near top gate, Cairns, Dec 1938, *Flecker* (BRI); State Forest Reserve 310, 17°23′S, 145°45′E, Nov 1976, *Hyland* 9181 (BRI,L,QRS); Russell River, Jul 1960, *Trapnell* 96 (BRI); Ebony Creek, Ravenshoe, 17°09′S, 145°28′E, Sep 1978, *Lockyer* (CANB,JCT,NSW); The Boulders, N of Innisfail, Apr 1984, *Wright* (CBG,MEL,MO). NORTH KENNEDY DISTRICT: Kirrama State Forest, NW of Cardwell, Jun 1977, *Winsor* (BISH,PERTH); 15 km E of Wallaman Falls, 18°36′S, 145°50′E, Nov 1986, *Jackes* 8612 (A,BISH,BRI,CANB,CBG,DNA,JCT,K,L,MEL,MO,NE,NSW,PERTH,QRS); Bluewater Forestry Reserve, N of Townsville, 19°12′S, 146°23′E, Oct 1977, *Jackes* (BRI,CANB,NSW,QRS).

Specimens from 24 localities were examined.

Distribution and Habitat: This species is confined to the area between 16°40′S and 18°36′S (**Map 4**) where it is found only in vine forest or in vine forest remnants. Soils are chiefly red volcanic loams.

Flowering period: Spring, particularly October and November.

Fruiting period: Summer.

Notes and Observations: This species is readily distinguished from *C. repens* with which it has often been confused by the firm mature leaves which dry dark grey; presence of hairs; the bifid tendrils; the non-succulent stem and the convolutions of the endotesta.

Etymology: The specific epithet refers to the burgundy coloured lower surface of the young leaves.

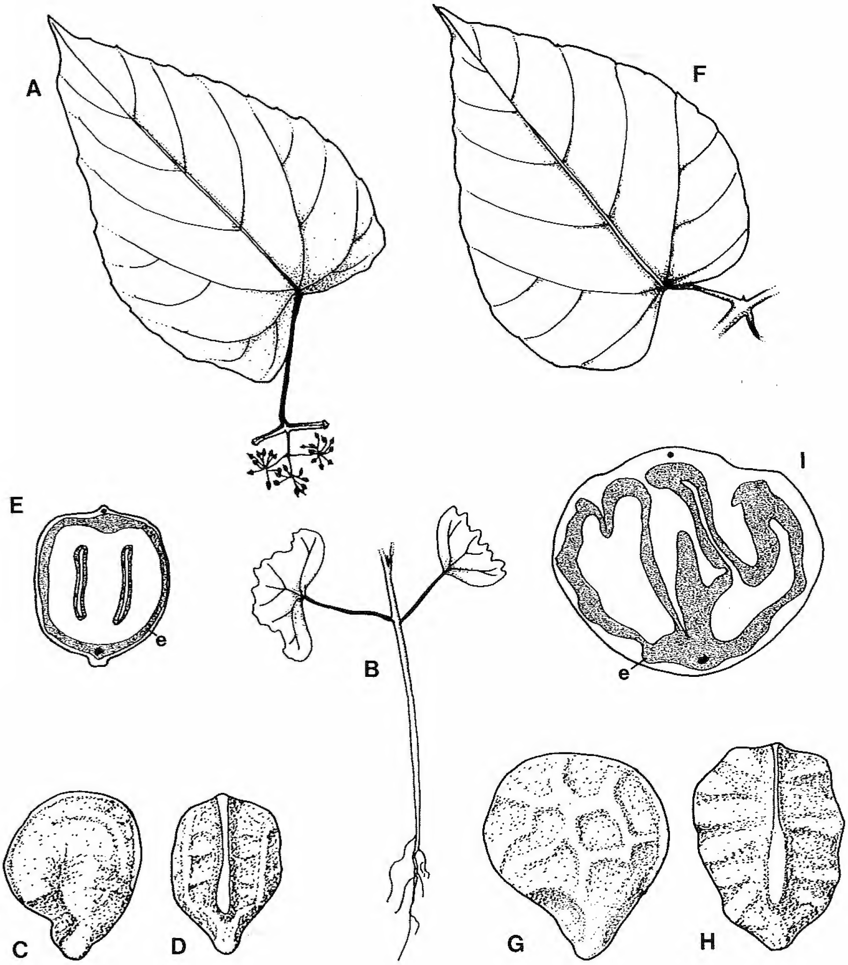

Fig. 5. *Cissus hastata*: A. leaf and inflorescence × 0.5. B. seedling × 0.5. C. seed, surface × 5. D. seed, dorsal surface showing position and shape of perichalaza × 5. E. median T.S. of mature seed × 6. *C. vinosa*: F. leaf × 0.5. G. seed, lateral surface × 5. H. seed, dorsal surface showing position and shape of perichalaza × 5. I. median T.S. of mature seed × 6. (e – lignified endotesta).

11. Cissus opaca F. Muell., Trans. & Proc. Philos. Inst. Victoria 3: 23 (1859). **Type:** Brigalow scrub of eastern Australia. Planchon in A. & C DC., Monogr. phan. 5: 518 (1887); Domin, Biblioth. Bot. 89: 368 (1927).

Vitis opaca Benth., Fl. austral. 1: 450 (1863). **Syntypes:** Burdekin River, Nov 1856, *Mueller* (K,MEL); Brisbane River, Moreton Bay, Jul 1855, *Fraser*, *Mueller* (K,MEL); Rockhampton, *Thozet* (MEL); Port Denison, *Fitzalan* (MEL); East Coast, 1802, *Brown* (E,K,MEL,P). F. Muell., Fragm. 5: 210 (1866), 6: 177 (1868), 9: 125 (1875); C. Moore, Handb. fl. N.S.W. 214 (1893); F.M. Bailey, Queensl. fl. 1: 283 (1899).

Cayratia cuneata Domin, Biblioth. Bot. 89: 370 (1927). **Type:** Chillagoe, Nov 1910, *Domin* (PR).

Vine or sprawling shrub, branches thin, striate, glabrous or pubescent, hairs uniseriate, 6–14-celled. Tendrils usually unbranched, glabrous or uniseriate hairs present at the base. Plants rarely completely deciduous, tubers present. Leaves palmately compound, 3–5(–7)-foliolate, leaflet bases attenuate to the point of attachment of the petiole; distinct petiolules rare. Shape of central leaflet varies from obovate to oblanceolate to oblong to lanceolate to linear-lanceolate; apex acuminate to truncate, (1.3–)5.9(–14) cm × (0.2–)1.5(–4.5) cm. Lateral leaflets oblique at base; upper laterals (1–)5.4(–11.2) cm × (0.2–)1.6(–3) cm; lower laterals (0.7–)3.1(–5.8) cm × (0.2–)0.8(–1.8) cm. Margins entire or variously indented. Upper surface glabrous or with uniseriate 8–10-celled hairs present, these are often associated with the midrib or petiole/lamina junction. Lower surface often glabrous, occasionally glaucous, hairs when present uniseriate, 8–10-celled. Petiole often ridged, uniseriate hairs may be present, (1–)2.3(–5) cm long. Stipules triangular, 1–2 mm × 0.5–1 mm. Inflorescence umbellate, the normally unbranched tendrils divide and one or both branches are terminated by 1–2 umbels, each with 4–10 flowers. Uniseriate 2–5-celled hairs may be present except on the pedicels which are often papillose. Calyx 5-lobed, 0.5–0.75 mm long, sometimes papillose. Corolla with 5 free lobes rarely cohering at the apex, creamy-green to reddish-brown, 1.5–2 mm long. Filaments 0.75–1 mm long, anthers 0.5 mm long. Ovary glabrous, disc thick, lobed; style conical. Berry globular or depressed-globular, bluish-black often with a glaucous bloom, 6–10 mm × 7–12 mm. Seeds 2–4 per fruit, pyriform, 5–7 mm × 4–5.5 mm; perichalaza forms a rounded depression on the dorsal surface; endosperm in transverse section W-shaped. Cotyledons similar. **Fig. 6A–F.**

Representative specimens examined: Queensland. Cook District: Badu Island, 10°09′S, 142°10′E, Oct 1981, *Clarkson* 4010 (BRI,JCT); 10 km NE of Weipa, Jun 1982, *Jackes* (CANB,NSW); Base of Black Mountain, Dec 1965, *Rodd* 221 (NSW); Mareeba–Atherton Road, *ca* 1 km S of Walkamin, 17°08′S, 145°25′E, Jan 1980, *Clarkson* 2746 (BRI,JCT). North Kennedy District: 3 km W of Ravenshoe near Bald Rock, Mar 1979, *Lockyer* (CANB,DNA,QRS); Ollera Creek, 19°00′S, 146°21′E, Jan 1979, *Jackes* (A,BISH,BRI,CANB,CBG,K,L,MEL, MO,NSW,PERTH,QRS); Port Clinton, Aug 1802, *Brown* 5248 (BM,E,K). South Kennedy District: Hayman Island, Jun 1934, *White* 10078 (A,BRI,MO). Port Curtis District: Shoalwater Bay, 22°20′S, 150°11′E, Jul 1971, *Tracey* 14708 (BRI,JCT,QRS). Leichhardt District: Isla Gorge *ca* 8 km SW of Theodore, *Sharpe & Hockings* (BRI); 12 miles [19.2 km] S of Wandoan, Oct 1963, *Speck* 1909 (BRI,CANB,K,NSW). Wide Bay District: Sandy Cape, Fraser Island, May 1894, *Lovell* (BRI). Moreton District: Stradbroke Island, Jun 1974, *Everist* (BRI). **New South Wales.** North Coast: Bibock near Captain Mayne's (N of Singleton), Jan 1843, *Leichhardt* (NSW). Central Coast: Razorback Mountain, Camden, Aug 1968, *McBarron* 15493 (NSW). Northern Tablelands: Wollomombi Falls, Nov 1967, *Williams* (NE). North Western Slopes: 5 miles [8 km] from Aberdeen on Rouchelbrook Road, Mar 1960, *Story* 7090 (CANB,K); Wellington, Oct 1886, *Betche* (NSW).

Specimens from 120 localities were examined.

Distribution and Habitat: This species is widespread in Queensland and New South Wales (**Map 12**), where it commonly grows on rocky outcrops in open forest or in vine thickets, although it is sometimes associated with brigalow or vine forest edges. Soils are variable.

Flowering period: Throughout the year, common in summer.

Fruiting period: Throughout the year.

Notes and Observations: Superficially this highly variable species often appears to be more closely related to the monotypic genus *Clematicissus* endemic to the Geraldton area of Western Australia, with which it shares the unusual inflorescence arrangement, 5-merous flowers, and the sometimes shrubby habit. However, its closest relative is probably the South American species *Cissus tweedieana* (Baker) Planchon. This 5-merous species has variable leaf shapes and sizes, similar inflorescence and seed features (Mulgura de Romero 1978). The species as circumscribed above is highly variable; despite numerous attempts no patterns have emerged with respect to degree of pubescence or leaf shape.

Although densely pubescent leaves are common in the Chillagoe–Mareeba area, they occur spasmodically elsewhere. Leaf shape exhibited no apparent pattern. The largest leaves, which are also usually 3-foliolate, appear to occur in moist sites, particularly in protected areas on coastal islands. On Magnetic Island (19°08′S, 146°50′E) leaf size appears to decrease as drier habitats are encountered. At Fanning River (19°43′S, 146°26′E), plants with leaves exhibiting different shapes and degree of pubescence have been found within a 9 m^2 quadrat. Initial growth after germination is slow, whilst a tuber is forming. Twelve month old seedlings had 4–5 undivided leaves as well as senescing cotyledons. New growth, up to 40 cm, arising from tubers often has polymorphic simple leaves. Wild pigs are reported to dig for the tubers which were also eaten by aborigines.

Common name: "Pepper Vine" is a common name often applied to this species.

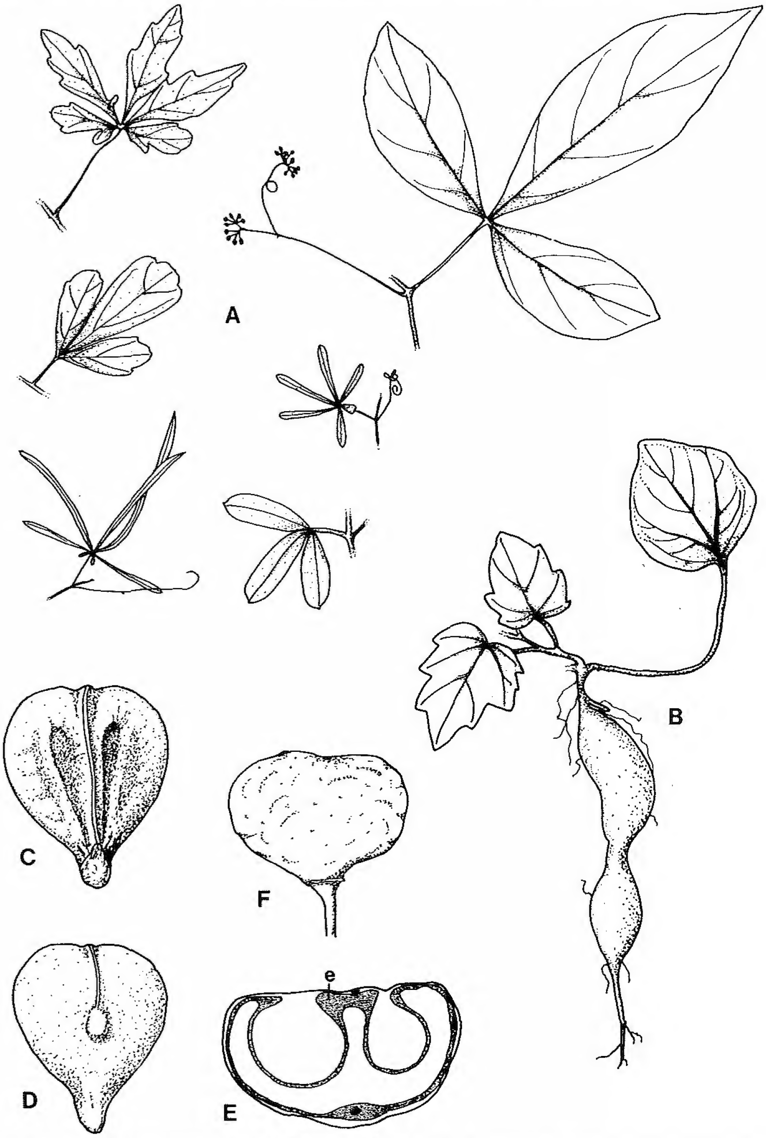

Fig. 6. *Cissus opaca*: A. a selection of leaf shapes and sizes × 0.5. B. twelve month old seedling with senescing cotyledons × 0.5. C. seed, ventral surface showing position of the raphe × 5. D. seed, dorsal surface showing position and shape of perichalaza × 5. E. median T.S. of mature seed × 6. F. fruit × 2. (e – lignified endotesta).

12. Cissus sterculiifolia (F. Muell. ex Benth.) Planchon in A. & C. DC., Monogr. phan. 5: 519 (1887); Domin, Biblioth. Bot. 89: 368 (1927).

Vitis sterculiifolia F. Muell. ex Benth., Fl. austral. 1: 450 (1863). **Type:** Hastings River, *Beckler* (MEL 539833,K,BM). F. Muell., Fragm. 9: 126 (1875); F.M. Bailey, Queensl. fl. 1: 283 (1899).

Cissus brachypoda (F. Muell.) Planchon in A. & C. DC., Monogr. phan. 5: 520 (1887).

Vitis brachypoda F. Muell., Fragm. 9: 125 (1875); F.M. Bailey, Queensl. fl. 1: 280 (1899). **Type:** Rockingham Bay, *Dallachy* (MEL 540135,K).

Vigorous vine, stems rounded or striate, lenticels in vertical rows, often prominent. Scattered, unicellular 2-armed hairs closely appressed to the surface and small uniseriate 1–3-celled hairs present. Tendrils unbranched, pubescent. Plants evergreen. Leaves palmately compound, 3–5-foliolate, leathery; central leaflet broadly lanceolate to oblong, apex acuminate, base attenuate to angustate, (7–)12.1(–16.5) cm × (3.5–)5.2(–9) cm; lateral leaflets oblique at base, upper laterals (6.2–)11.3(–14.8) cm × (2.7–)4.5(–7) cm; lower laterals (6–)8.5(–10) cm × (2–)3.6(–4) cm. Margins entire or several small serrations present on one or both sides of the midrib. Upper surface glossy green, glabrous or with scattered pale to rusty-coloured unicellular, 2-armed hairs, midrib prominent, yellowish green. Lower surface pubescent, hairs pale to rusty-coloured often concentrated near the veins. Domatia in axils of midrib and main laterals. Central petiolule grooved above, (0.8–)1.2(–2.5) cm long; lateral petiolules grooved above, upper (0.2–)1(–2) cm long, lower (0.5–)0.8(–1.1) cm long. Petiole rounded, (0.5–)3.9(–8) cm long; junction of petiole with stem and with petiolules usually swollen, the former is twisted. Stipules triangular, 3–3.5 mm × 1–2.5 mm, glabrous or pubescent. Inflorescence umbellate, 3–8 cm long, 2 primary branches; peduncle 1–3.5 cm long, scattered hairs often present. Calyx 0.5 mm long, papillose. Corolla white, 1–5 mm long, papillose. Filaments 0.75 mm long, anthers 0.5 mm long. Berry ovoid to elongate-falcate, purplish black, 10–20 mm × 6–10 mm. Seeds 1–2(–3) per fruit, ovoid or falcate, 8–18 mm × 5–8 mm; endosperm in transverse section deeply dissected by the endotesta; raphe rarely extends to dorsal surface. **Fig. 7A–E.**

Representative specimens examined: Queensland. Cook District: Timber Reserve 55, 16°20′S, 145°20′E, Jul 1974, *Hyland* 7349 (JCT,QRS); Mount Father Clancy, Ravenshoe, Dec 1978, *Lockyer* (BISH,BRI,CANB, JCT,K,L,MO,NSW,QRS). North Kennedy District: Near Foxwood's Turnoff, Kirrama *ca* 40 km W of Kennedy, 18°10′S, 145°40′E, Sep 1978, *Lockyer* (A,BRI,CANB,DNA,JCT,K,L,MEL,MO,NSW,PERTH,QRS); Bluewater Forestry Reserve, N of Townsville, Sep 1976, *Jackes* (CANB,CBG,JCT). South Kennedy District: Dalrymple Heights and vicinity, Jul–Nov 1947, *Clemens* (A,BRI,K,L). Leichhardt District: Blackall Range, Apr 1918, *White* (BRI). Wide Bay District: Fraser Island, May 1964, *Webb & Tracey* (BRI). Moreton District: Nerang River, Nov 1917, *White* (BRI). **New South Wales.** North Coast: Dorrigo National Park, Feb 1980, *Williams* (CBG,JCT,QRS); Seal Rocks, 20 miles [32 km] E of Buladelah, Aug 1964, *Briggs* (NSW). Central Coast: Below Bulli Lookout, Jan 1958, *Williams* (NE).

Specimens from 53 Australian localities were examined.

Distribution and Habitat: This species, which also occurs in southern New Guinea, is found in vine forest from the Atherton Tableland to south of Sydney (**Map 10**). Soils are variable.

Flowering period: November to January.

Fruiting period: February to October.

Notes and Observations: A form occurs on the Atherton Tableland in which the leaves are generally broader and often twisted so that they rarely lie flat and the associated fruit, which is usually elongated and somewhat falcate, contains 1–2 elongated seeds (**Fig. 7E**). When 2 seeds are present they will be unequal in size. However there is no absolute character or set of characters which distinguishes this form from all other specimens of *C. sterculiifolia.* Petiole length and thickness is highly variable even on the same plant, although specimens with short petioles tend to occur more frequently in North Queensland.

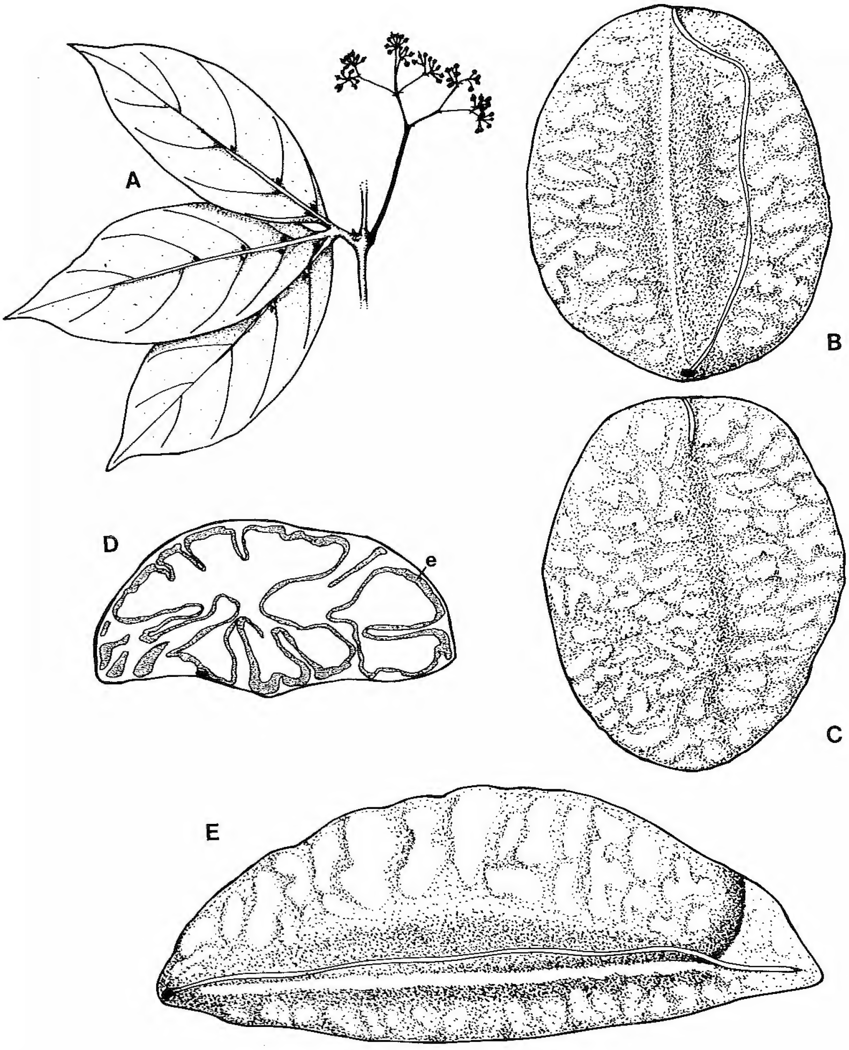

Fig. 7. *Cissus sterculiifolia*: A. leaf and inflorescence × 0.5. B. seed, ventral surface showing position of the raphe × 5. C. seed, dorsal surface showing position and shape of perichalaza × 5. D. median T.S. of mature seed × 6. E. elongated seed, ventral surface showing position of raphe × 5. (e – lignified endotesta).

13. Cissus penninervis (F. Muell.) Planchon in A. & C. DC., Monogr. phan. 5: 520 (1887).

Vitis penninervis F. Muell. Fragm. 6: 177 (1868). **Type:** Rockingham Bay, *Dallachy* (MEL 539843,K). F.M. Bailey, Queensl. fl. 1: 283 (1899).

Cissus arthroclada Lauterb., Bot. Jahrb. Syst. 59: 524 (1925). **Syntypes** (seen): *Ledermann* 6958 and 10349 (K).

Vigorous vine, stem striate, glabrous, vertical rows of whitish lenticels may be prominent on older stems; internodes often short; short side branches common. Tendrils unbranched. Plants evergreen. Leaves palmately compound, 3–5-foliolate, number often variable on the same plant, glabrous. Central leaflet obovate, attenuate at the base, apex acuminate, (6.2–)9.7(–11) cm × (2.6–)3.4(–4.1) cm; lateral leaflets slightly oblique at the base, upper laterals (5.8–)8.1(–11.3) cm × (2.3–)3.2(–4) cm, lower laterals (4.5–)6.5(–7.8) cm × (2–)2.6(–3) cm. Margins usually smooth or occasionally widely spaced shallow serrations may be present. Upper and lower surfaces glabrous. Main secondary veins are approximately parallel to one another and form an angle with the midrib of *ca* 70°. Petiolules rarely distinct. Petioles glabrous, ridge present on the upper surface, (3.1–)4.1(–5) cm long, junction of petiole with stem as well as with the leaflets usually swollen and the former is frequently twisted. Stipules triangular, 1 mm × 1 mm, early caducous. Inflorescence paniculate with terminal umbels, 7–12 cm long, 2–4 primary branches; peduncle 3–5 cm long. Calyx 0.5 mm long, glabrous. Corolla creamy green to yellowish, 1–1.5 mm long. Filaments 0.75 mm long, anthers 0.5 mm long. Berry globular to obovoid, purple to bluish black, 10–12 mm × 8–12 mm. Seeds 1–4 per fruit, ovoid, 7.5–9 mm × 4–5 mm; endosperm in transverse section dissected by the convolutions of the endotesta. **Fig. 8A–D.**

Representative specimens examined: Queensland. COOK DISTRICT: Timber Reserve 14, McIlwraith Range, 13°45′S, 143°20′E, Jul 1977, *Unwin* 395 (QRS); Upper Cameron Creek, NW of Cooktown, 15°22′S, 145°07′E, Jul 1976, *Tracey* 14632 (BRI,QRS); State Forest Reserve 755, 17°25′S, 145°45′E, Dec 1972, *Hyland* 6593 (QRS); 24 miles [38.4 km] S to SSE of Ravenshoe, Dec 1978, *Lockyer* (A,CANB,K,L). NORTH KENNEDY DISTRICT: Kirrama State Forest, NW of Cardwell, Jun 1977, *Winsor* (BRI); 3.6 km W of Paluma Village, 19°00′S, 146°13′E, Nov 1986, *Jackes* 8613 (A,BISH,BRI,CANB,CBG,DNA,JCT,K,L,MEL,MO,NE,NSW,PERTH,QRS). SOUTH KENNEDY DISTRICT: Eungella Range, Oct 1922, *Francis* (BRI).

Specimens from 29 Australian localities were examined.

Distribution and Habitat: Restricted to vine forests in North Queensland (**Map 9**) and southern New Guinea. Soils are variable.

Flowering period: November to April in Australia, in New Guinea it appears to be February to July.

Fruiting period: Fruits have been collected from January to March.

Notes and Observations: This species is readily distinguished from the other species by the approximately parallel secondary veins. The flowers are the smallest of all Australian species of *Cissus*. Most vines observed by the author do not flower every year.

14. Cissus hypoglauca A. Gray, U.S. Expl. Exped., Phan. 1: 272 (1854). **Type:** New South Wales, near Sydney, *U.S. Expl. Exped.* (GH). Planchon in A. & C. DC., Monogr. phan. 5: 519 (1887); Domin, Biblioth. Bot. 89: 368 (1927).

Vitis hypoglauca F. Muell., Pl. Victoria 1: 94. t. 10. (1860–62); Benth., Fl. austral 1: 450 (1863); F. Muell., Fragm. 6: 177 (1868); C. Moore, Handb. fl. N.S.W. 213 (1893); F.M. Bailey, Queensl. fl. 1: 282 (1899).

Cissus australasica F. Muell. Trans. Philos. Soc. Victoria 1: 8 (1855). **Type:** Brodribb River, Jan 1855, *Mueller* (MEL 540172,K).

Vigorous vine, stems thick, striate, often reddish, usually pubescent, young shoots rusty tomentose, hairs unicellular, 2-armed concentrated at the nodes. Tendrils bifid, rarely unbranched, pubescent. Plants evergreen. Leaves palmately compound, 5-foliolate, dull to glossy green above, pale green to glaucous below, main veins and petiolules may be carmine in colour. Central leaflet broadly lanceolate to obovate, apex acuminate, base rounded, (6.2–)8(–11) cm × (2.1–)3.7(–5.2) cm; lateral leaflets slightly oblique at the base, upper laterals(5.2–)7.4(–10) cm × (2–)3.4(–4.3) cm, lower laterals (2.5–)5.6(–7.5) cm × (1.3–)2.6(–3.8) cm. Margins usually entire, some serrations occasionally present. Upper surface usually glabrous at maturity, hairs if present rusty-coloured, unicellular, 2-armed, lower surface varies from densely tomentose to glabrous, often glaucous. Petiolules grooved on upper surface, usually pubescent; central petiolule (1–)2(–3) cm long, upper laterals (0.8–)1.5(–2.1) cm long, lower laterals (0.6–)1(–1.7) cm long. Stipules pubescent, forming a pocket around developing leaf, early deciduous, 8–14 mm × 3–6 mm. Inflorescence paniculate with terminal umbels, 4–7 cm long, 2–3 primary branches; peduncle 2–4.5 cm long, pubescent. Calyx entire or shallowly lobed, 0.75–1 mm long. Corolla yellow, 1.5–2.5 mm long. Filaments 0.75–1 mm long, anthers 0.75–1 mm long. Disc lobed. Berry globular, purplish-black to black often with a glaucous bloom, 10–12 mm × 9–10 mm. Seeds 2–4 per fruit, ovoid, 4–6.5 mm × 4–4.5 mm. Endosperm in transverse section T- to W-shaped, length of the lateral extension varies with the number of seeds per fruit and thus shape in transverse section. Cotyledons similar. **Fig. 8E–I.**

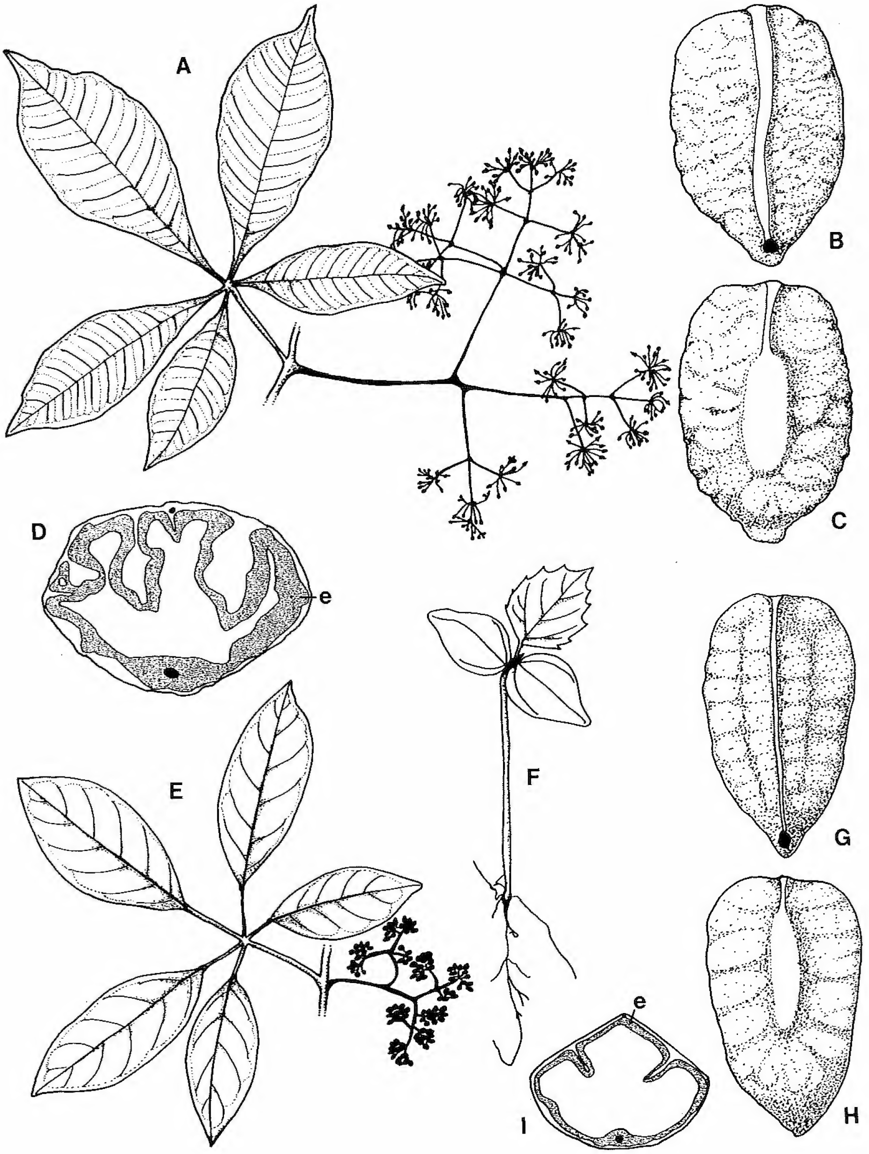

Fig. 8. *Cissus penninervis*: A. leaf and inflorescence × 0.5. B. seed, ventral surface showing position of the raphe × 5. C. seed, dorsal surface showing position and shape of perichalaza × 5. D. median T.S. of mature seed × 6. *C. hypoglauca*: E. leaf and inflorescence × 0.5. F. seedling × 0.5. G. seed, ventral surface showing position of the raphe × 5. H. seed, dorsal surface showing position and shape of perichalaza × 5. I. median T.S. of mature seed × 6. (e – lignified endotesta.).

Representative specimens examined: Queensland. COOK DISTRICT: Windsor Tableland, 16°20′S, 145°10′E, Jun 1980, *Heinsohn* (DNA,JCT); State Forest Reserve 194, 17°20′S, 145°25′E, Mar 1975, *Irvine* 1265 (BRI,CANB,K,L,QRS); Mount Baldy *ca* 2 miles [3.2 km] SW of Atherton, Aug 1978, *Lockyer* (BRI). NORTH KENNEDY DISTRICT: Kirrama State Forest, NW of Cardwell, Jun 1977, *Winsor* (BRI,CANB,CBG); Mount Elliott, 19°30′S, 147°00′E, Dec 1977, *Hyland* 9564 (QRS). SOUTH KENNEDY DISTRICT: Crediton, 21°10′S, 148°30′E, May 1975, *Hyland* 8195 (BRI,L,QRS). LEICHHARDT DISTRICT: Blackdown Tableland *ca* 32 km SE of Blackwater, Apr 1971, *Henderson, Andrews & Sharpe* (BRI). WIDE BAY DISTRICT: Fraser Island, May 1964, *Webb & Tracey* (BRI). MORETON DISTRICT: Jimboomba, SW of Beenleigh, Apr 1907, *Boorman* (NSW). **New South Wales.** NORTH COAST: Wiangaree near Kyogle, May 1946, *Carter* (CANB). CENTRAL COAST: Wyong, Dec 1893, *Betche* (NSW). SOUTH COAST: Kioloa State Forest, *ca* 10 miles [16 km] N of Bateman's Bay, Oct 1966, *Schodde* 5091 (A,BRI,CANB,K,L); Mumbulla Mountain, *ca* 10 miles [16 km] NNE of Bega, May 1966, *Constable* (K,NSW). NORTHERN TABLELANDS: Gibraltar Range State Forest, *ca* 22 miles [35.2 km] ENE of Glen Innes, May 1961, *Constable* (A,K,L,NSW). CENTRAL WESTERN SLOPES: Wybong Creek, Kars Springs *ca* 27.5 km SW of Murrurundi, Jan 1969, *Pickard & Coveny* 1221 (NSW). **Victoria.** Coolwater Creek, Alfred National Park, Feb 1969, *Canning & Telford* (NSW); Toorloo Arm, Jan 1966, *Henshall* (NT); Mount Buck, Feb 1901, *Pescott* (K,L,NSW).

Specimens from 150 Australian localities were examined.

Distribution and Habitat: Vine forest or vine forest regrowth occasionally in associated eucalypt forest. It ranges from eastern Victoria to north of the Daintree River, 16°15′S, 145°25′E, (**Map 11**). It also occurs in southern New Guinea. Soils are variable.

Flowering period: Mainly November to April.

Fruiting period: February to July.

Notes and Observations: A distinctive species with distinct petiolules, which differ from those in the genus *Cayratia* by the manner of attachment which is rather like the spokes of a wheel to a central column, as well as in the relative lengths of the petiolules. Considerable variation in degree of pubescence, glaucousness and anthocyanin present occurs in addition to age related changes. Fruit recorded as edible but astringent.

Common name: Water can be extracted from the stem, hence the common name "Water Vine".

Acknowledgements

I am indebted to Mr L. Pedley for preparing the Latin diagnoses. The assistance of the Directors of Herbaria who very kindly lent specimens and/or allowed me access to their collections is much appreciated. Mrs H. Winsor and Mrs D. McNamara gave invaluable assistance with the preparation of the manuscript. My husband was a willing collector of specimens and organizer of field trips.

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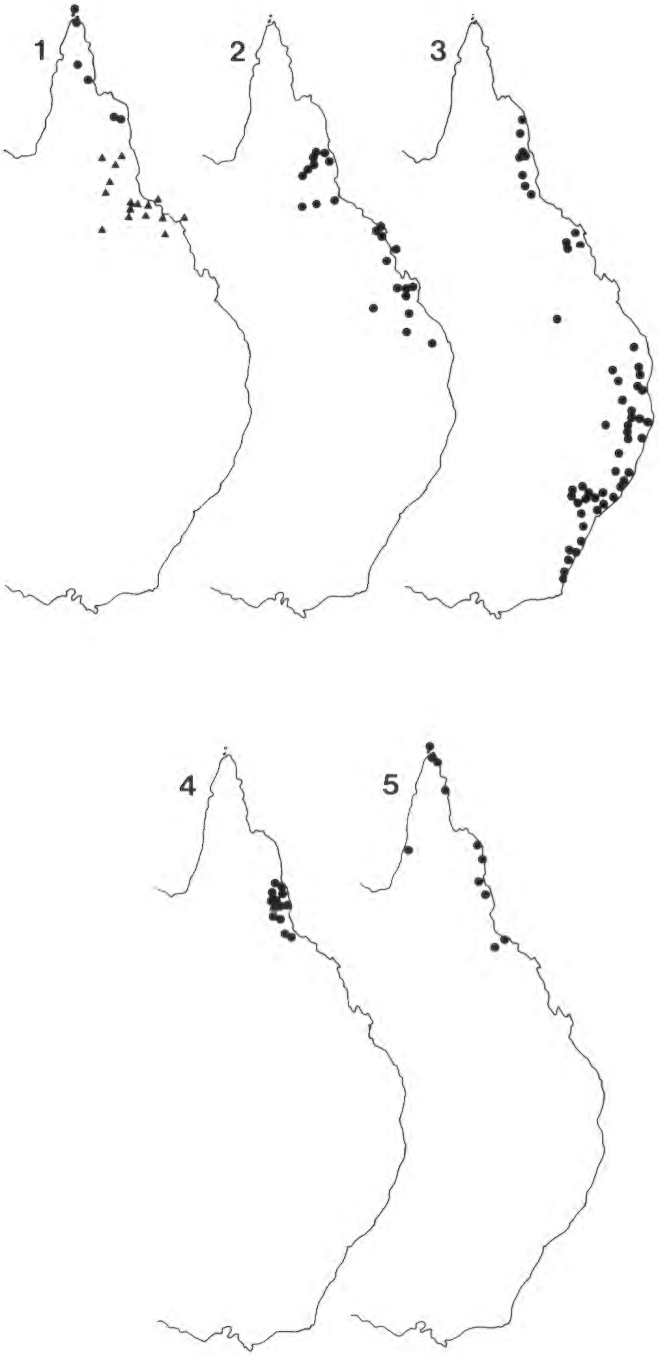

Maps 1–5. 1. ● *Cissus pentaclada*, ▲ *C. cardiophylla*. 2. *C. oblonga*. 3. *C. antarctica*. 4. *C. vinosa*. 5. *C. repens*.

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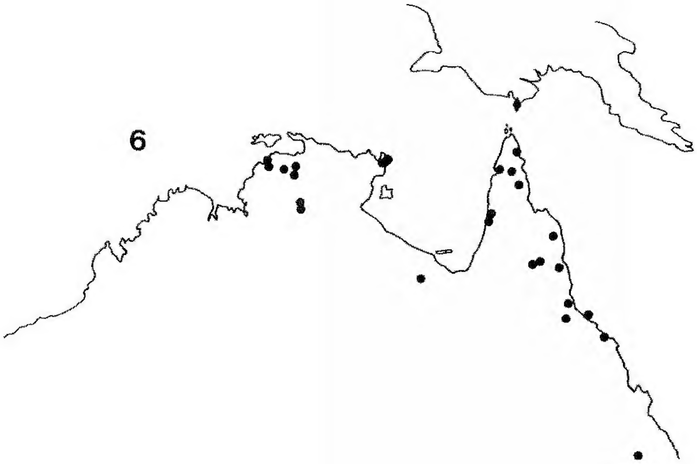

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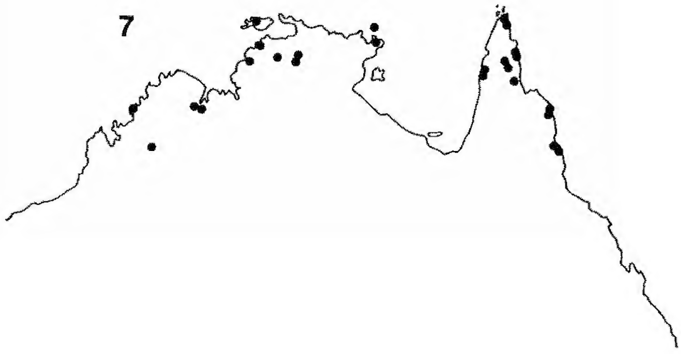
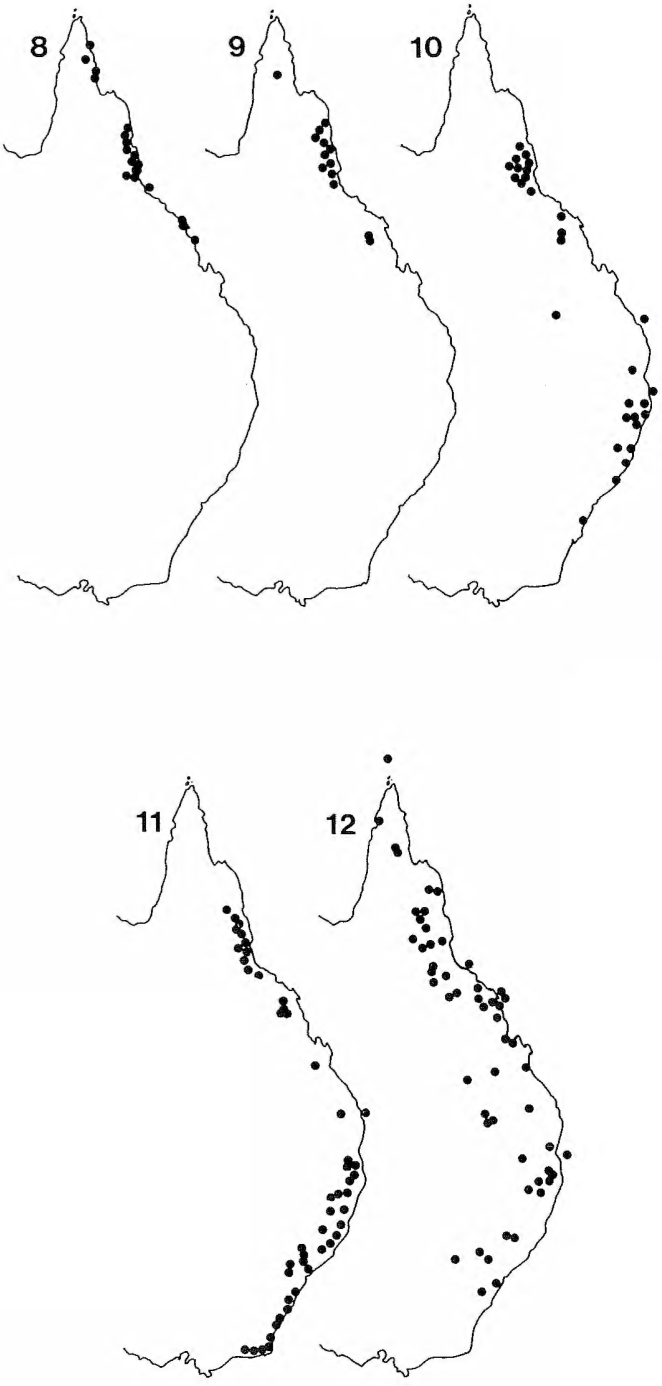


Maps 6–7. 6. ● *Cissus reniformis*, ◆ *C. aristata*. 7. *C. adnata*.



Maps 8–12. 8. *Cissus hastata*. 9. *C. penninervis*. 10. *C. sterculiifolia*. 11. *C. hypoglauca*. 12. *C. opaca*.